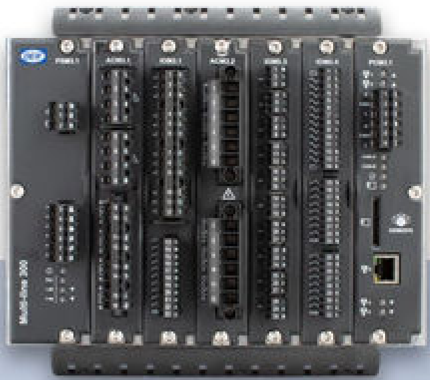
AMC 300

4189341265G

Programmable Automation Controller

Installation instructions

Improve Tomorrow



1. About the installation instructions

1.1 Intended users of the Installation instructions

The Installation instructions are primarily intended for the installer who mounts and wires up the controllers. The Installation instructions can also be used for commissioning to check the installation.

You can find other technical documentation for AMC 300 at www.deif.com/documentation/amc-300/

1.2 Symbols for hazard statements

DANGER!

This shows dangerous situations.

If the guidelines are not followed, these situations will result in death, serious personal injury, and equipment damage or destruction.

WARNING

This shows potentially dangerous situations.

If the guidelines are not followed, these situations could result in death, serious personal injury, and equipment damage or destruction.

CAUTION

This shows low level risk situation.

If the guidelines are not followed, these situations could result in minor or moderate injury.

NOTICE

This shows an important notice

Make sure to read this information.

1.3 Symbols for general notes

NOTE This shows general information.

More information
This shows where you can find more information.

Example

This shows an example.

How to ...
This shows a link to a video for help and guidance.

1.4 Technical support

Technical documentation

Download the technical documentation from the DEIF website: https://www.deif.com/documentation/amc-300/

Service and support

DEIF is committed to being available to our customers and partners 24 hours a day, seven days a week, to guarantee the highest levels of service and support.

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Training

DEIF arranges **training courses** at DEIF offices worldwide.

https://www.deif.com/training

Additional service

DEIF offers **service** with design, commissioning, operating and optimisation.

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1.5 Warnings and safety

Safety during installation and operation

When you install and operate the equipment, you may have to work with dangerous currents and voltages. The installation must only be carried out by authorised personnel who understand the risks involved in working with electrical equipment.

DANGER!

Hazardous live currents and voltages

Do not touch any terminals, especially the AC measurement inputs and the relay terminals, as this could lead to injury or death.

Disable the breakers (if applicable)

DANGER!

Disable the breakers

Unintended breaker closing can cause deadly and/or dangerous situations.

Disconnect or disable the breakers BEFORE you connect the controller power supply. Do not enable the breakers until AFTER the wiring and controller operation are thoroughly tested.

Disable the engine start (if applicable)

DANGER!

Unintended engine starts

Unintended engine starts can cause deadly and/or dangerous situations.

Disconnect, disable or block the engine start (the crank and the run coil) BEFORE you connect the controller power supply. Do not enable the engine start until AFTER the wiring and controller operation are thoroughly tested.

Metal fragments and other objects

Keep metal fragments and other objects out of the controller, as these can damage the equipment. Be especially careful when you install the equipment.

To prevent metal fragments from getting into the controller or extension rack, we recommend to place the supplied cover over the top ventilation holes when you install the rack. Remember to remove the cover after you finish the work. Failure to do so can damage the controller or extension rack.

Electrostatic discharge

Protect the equipment terminals from electrostatic discharge when not installed in a grounded rack. Electrostatic discharge can damage the terminals.

Controller power supply

The controller must have a reliable power supply and a backup power supply. The switchboard design must ensure sufficient protection of the system, if the controller power supply fails.

Connect the controller protective earth

DANGER!

Failure to ground

Failure to ground the controller (or extension rack) could lead to injury or death.

You must ground the controller (or extension rack) to a protective earth.

Factory settings

The controller is delivered pre-programmed from the factory with a set of default settings. These settings are based on typical values and may not be correct for your system. You must therefore check all parameters before using the controller.

Data security

The AMC 300 includes a firewall.

To minimise the risk of data security breaches we recommend:

- If possible, avoid to expose controllers and networks to public networks and the Internet.
- Use additional security layers like a VPN for remote access.
- Restrict access to authorised persons.

Do not use unsupported hardware modules

Only use the hardware modules that are listed in the Technical specifications. Unsupported hardware modules can make the controller malfunction.

1.6 Legal information

Third party equipment

DEIF takes no responsibility for the installation or operation of any third party equipment, including the **genset**.

Warranty

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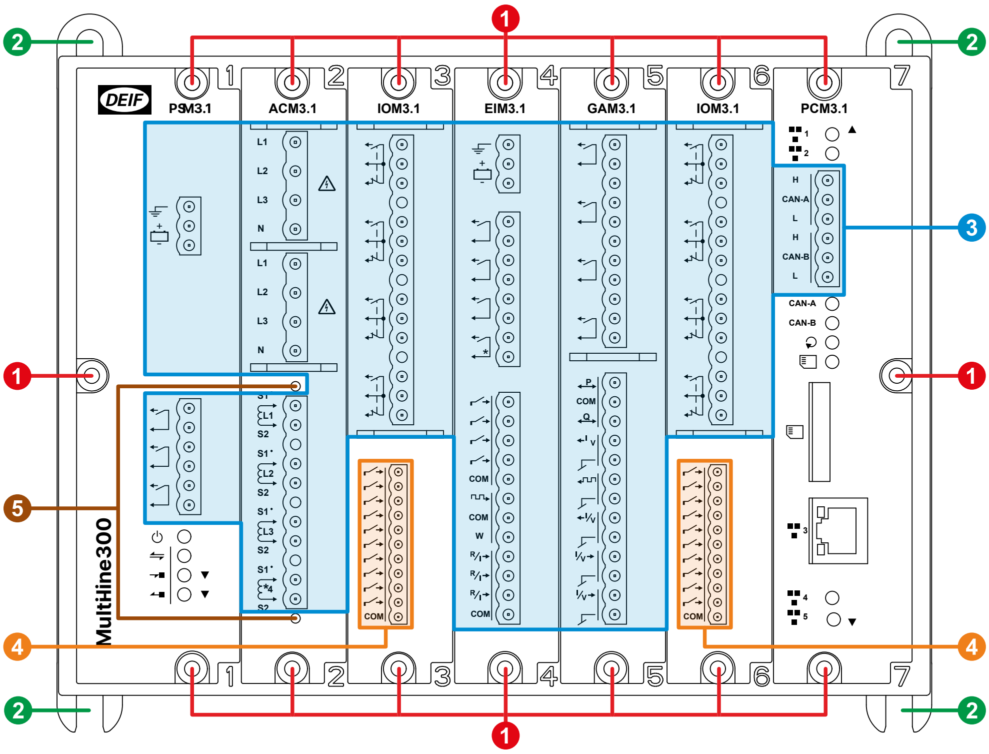
Copyright

2. Prepare for installation

2.1 Location

The equipment must be installed and operated in a clean and dry environment, as specified in the **Data sheet**. If the equipment is installed in an area subject to constant high vibrations, the equipment must be isolated from the vibrations. The installation environment must comply with the electrical, mechanical and environmental specifications of the equipment as described in the **Data sheet**.

2.2 Tools



#	Tool	Attachment	Torque	Used to
-	Safety equipment	-	-	Personal protection according to local standards and requirements.
-	Conducting wrist strap	-	-	Prevent damage from electrostatic discharge.
1	Screwdriver	TX20 bit	0.5 N·m (4.4 lb-in)	Remove or add modules in the rack.
-	Screwdriver	TX10 bit	0.5 N·m (4.4 lb-in)	Remove or remount the cable strain relief plates.
2	Wrench *	10 mm hex socket for 6 mm nuts (7/16 in hex socket for 1/4 in nuts)	5 N·m (44 lb-in)	Tighten the nuts on the mounting bolts.
3	Screwdriver	3.5 mm (0.14 in) flat-bladed bit	0.5 N·m (4.4 lb-in)	Connect the wiring to the 2.5 mm² terminals.
4	Screwdriver	2.5 mm (0.1 in) flat-bladed bit	0.25 N·m (2.2 lb-in)	Connect the wiring to the 1.5 mm² terminals.

#	Tool	Attachment	Torque	Used to
5	Screwdriver.	3.5 mm (0.14 in) flat-bladed bit	0.25 N·m (2.2 lb-in)	Remove and secure the current measurement terminal block to the ACM3.1 module faceplate.
-	Wire stripper, pliers and cutters.	-	-	Prepare wiring. Trim cable ties.

NOTE * The size of the torque wrench attachment depends on the nut and bolt size of the mounting bolts. These parts are not supplied by DEIF and the sizes mentioned are only a recommendation.

NOTICE

Torque damage to equipment

Do not use power tools during the installation. Too much torque damages the equipment.

Follow the instructions for the correct amount of torque to apply.

2.3 Materials

These materials are required when you install the controllers.

- Four fasteners per rack for mounting.
- Grounding wire for grounding the rack.
- Wires for wiring measuring points, switchboard and third party equipment (see the **Data sheet** for specifications).
- Ethernet cables to connect controllers and external systems (see the **Data sheet** specifications).
- Cable ties to secure wires and Ethernet cables (see Rack cable strain relief for more information).

3. Mount the equipment

3.1 Before you begin the installation

The controller comes with the ordered hardware modules pre-installed. Additional modules can be added or removed on site.

If you replace a hardware module with a different type, the controller loses its maritime classification societies approvals. Replacing with a module of the same type will not affect maritime classification societies approvals.

The controller or extension rack is mounted in an enclosure.

Changing the delivered configuration

You can mount the hardware modules in a different order from that recommended in these instructions. If you choose to do so, we recommend that you document the changes and include this information in the system documentation:

- Module name
- Module's rack slot number in the default configuration
- Module's rack slot number in your customised configuration

CAD drawings for the controller or extension rack can be downloaded from www.deif.com

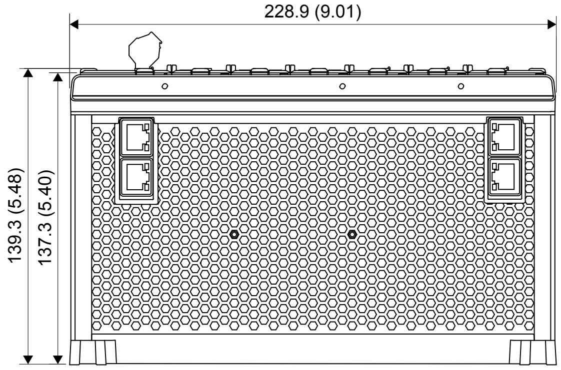
The download is available as AutoCAD file or STEP file.

3.2 Rack

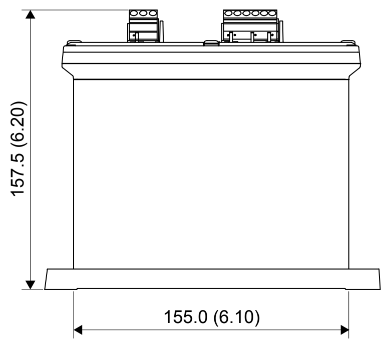
3.2.1 Rack dimensions

Dimensions are in mm, followed by approximate dimensions in inches. The racks are supplied with the cable strain relief plates mounted (not shown on R7.1 dimensions).

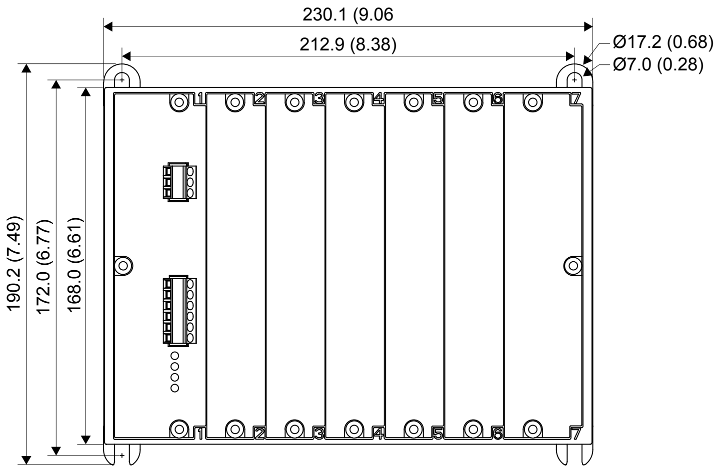
R7.1 dimensions



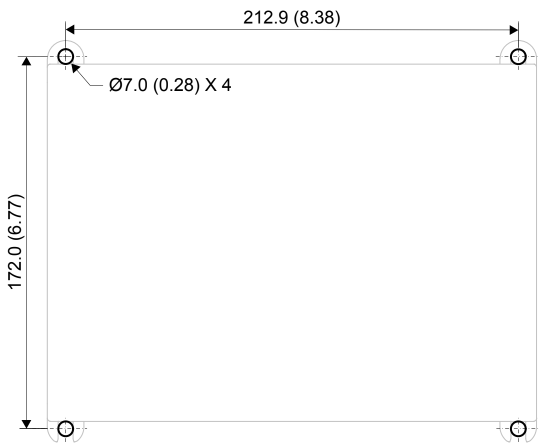
Top view



Side view

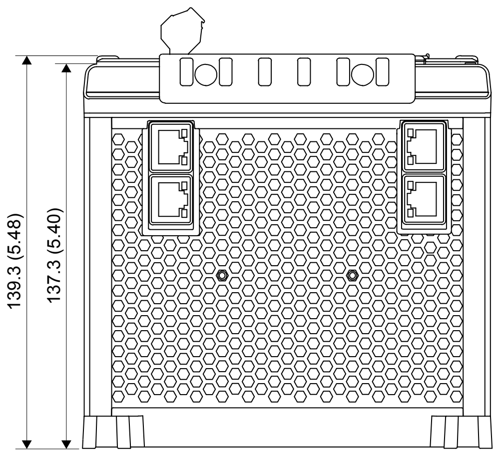


Front view

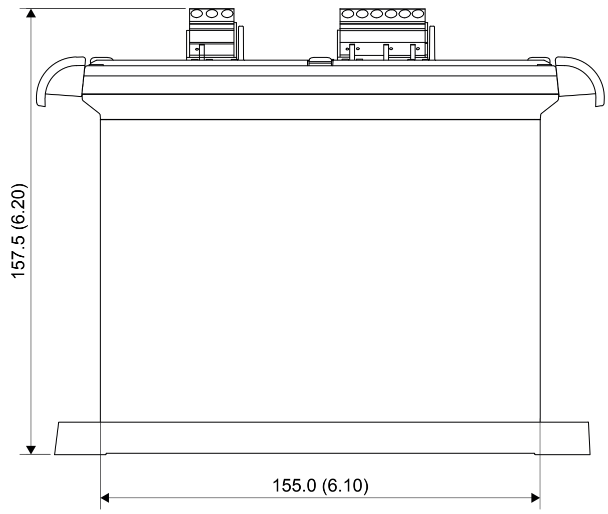


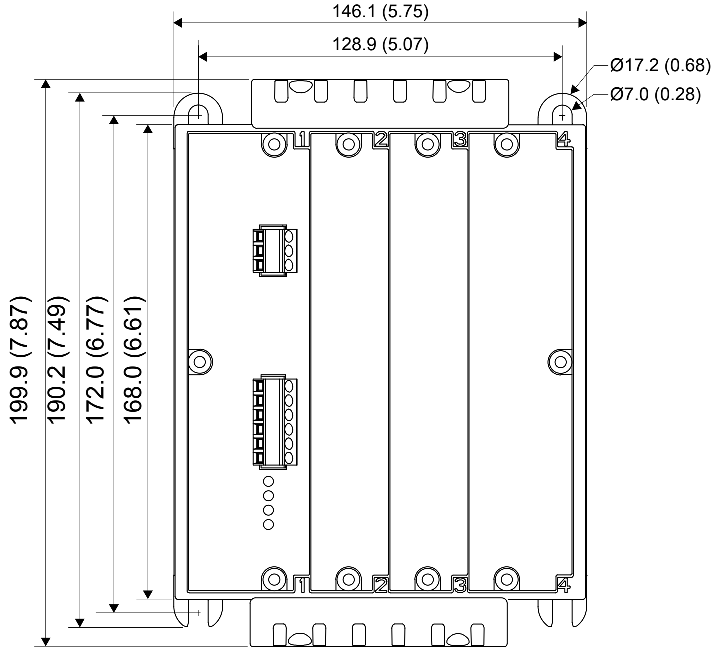
Drilling template *

R4.1 dimensions



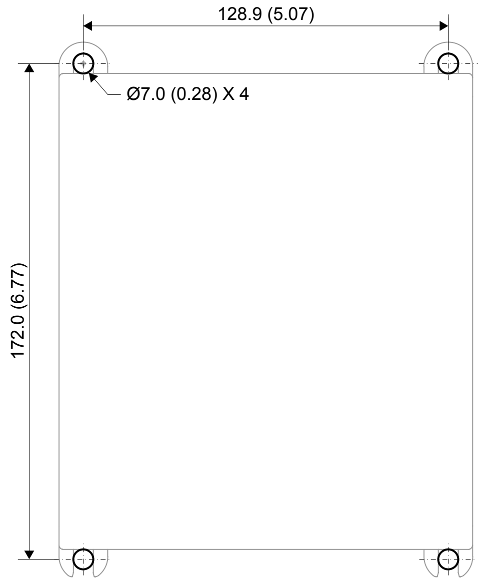
Top view





Front view

Side view



Drilling template *

NOTE The drilling template drawings are meant as guidelines. Use the dimensions given to create your drilling template.

3.2.2 Mount the rack

The rack is designed to be mounted in an enclosure.

For UL/cUL listing, the rack must be:
- Mounted on a flat surface of a type 1 enclosure.
- Installed in accordance with the NEC (US) or the CEC (Canada).

More information
See the **Data sheet** for more information about the electrical specifications.

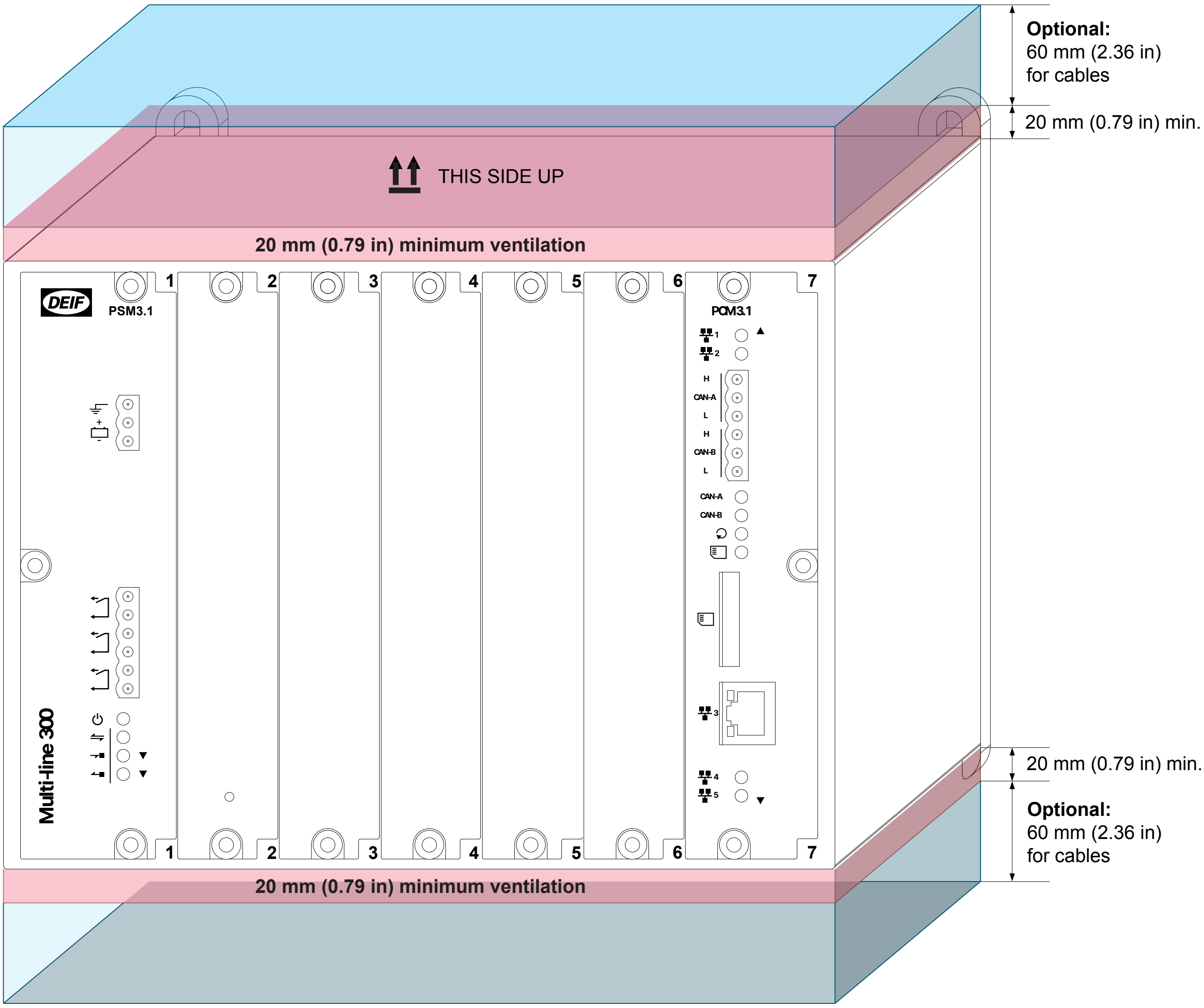
Dust accumulation may damage the controller or cause overheating. We recommend mounting the rack in a cabinet with a filter on the air supply.

Protect the controller terminals from static discharge during installation, especially while the frame ground is not connected.

Space around the controller

Allow 20 mm (0.8 in) free space above and below the rack frame for ventilation. Make sure there is enough space in front, above, and below the rack for the cables. Some cables may require a minimum bend radius. We recommend that you always follow the cable manufacturer's bend radius requirements.

Example:



Fasteners for mounting the rack

Fasteners for mounting are **not** supplied with the rack. The rack fasteners must be able to support the weight of the rack and the wiring.

Example: Calculating minimum bolt length
Mounting the rack using four Ø6 mm (1/4 in) bolts, four nuts and four Ø6 mm (1/4 in) washers.

For bolts, the minimum length is 12 mm (0.47 in) for the rack mounting loop. Length is also needed for the washer thickness (typically 1.5 mm), the nut (typically 4 mm), and the cabinet back plate thickness.

If the cabinet back plate is 2.5 mm (0.10 in) thick, then the minimum bolt length is 20 mm (0.79 in). For grounding, a slightly longer bolt is required.

Grounding the rack

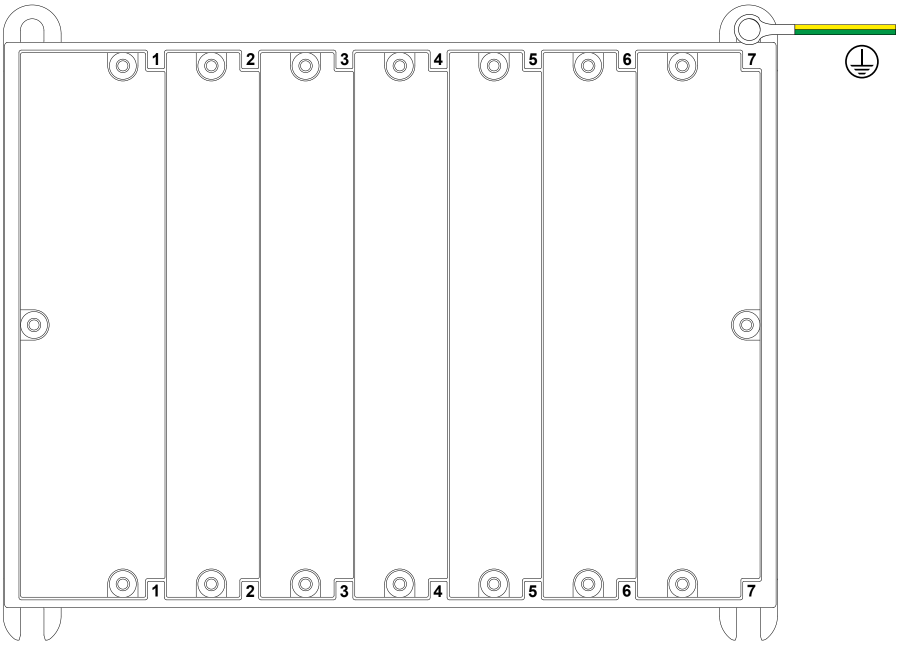
You must ground the controller or extension rack to a protective earth connection.

DANGER!

Failure to ground

Failure to ground the controller (or extension rack) could lead to injury or death.

You must ground the controller (or extension rack) to a protective earth.



Mounting the rack (example)

This is an example on how to mount the rack in an enclosure on a thin plate.

You will need:

- Marking pen
- Drill
- 5 mm drill bit
- Tapping tool
- 6 mm tap
- Four Ø6 mm fasteners (length depends on your installation environment)
- Four Ø6 mm double toothed washers
- Grounding cable with a Ø6 mm ring terminal

Mounting instructions:

1. Check that the free space required for ventilation and cables is available.
2. Mark the positions for the fasteners on the vertical surface where the rack will be mounted.
3. Drill and tap the holes for mounting the rack.
4. Place a washer on three of the four fasteners.
5. Loosely mount a fastener with a washer in both of the lower mounting holes. At least 13 mm should be available between the enclosure surface and the washer.
6. Place the rack on top of the fasteners.
    - The washers must be between the head of the fastener and the rack.
    - The rack must be mounted with its back vertical, and its long axis horizontal.
7. Mount the third fastener with a washer in the top left mounting position.
8. Tighten the three fasteners to 5 N·m (44 lb-in) of torque.
9. Place a grounding hoop, followed by a toothed washer, on the remaining fastener.
10. Mount the last fastener in the top right mounting position.

11. Tighten the last fastener to 5 N·m (44 lb-in) of torque.
12. Galvanically connect the other end of the grounding wire to the grounding position of the enclosure.

3.2.3 Rack cable strain relief

The rack is delivered with cable strain relief plates mounted at the top and the bottom. You can secure cables to these plates with cable ties.

Unscrew the three 3 mm screws with a T10 screwdriver to remove a plate. Tighten the screws to 0.5 Nm (4.4 lb-in) of torque when you remount a plate

Cable tie slots

On the rack, there are six cable tie slots at the top, and six slots at the bottom. Before the cable tie slots at the top are used, the foil cover must be removed completely.

The maximum cable tie width is 2.5 mm (0.1 in). The cable ties and cable routing must not block more than 20 % of the ventilation holes.

Figure 3.1 Cable tie slot positions shown by red cable ties (Slot detail A)

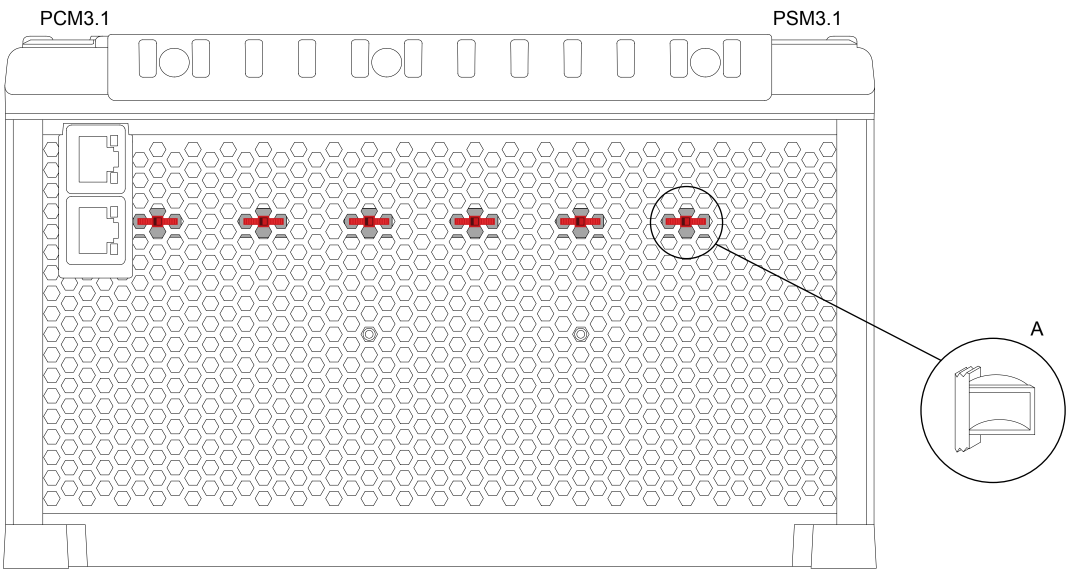
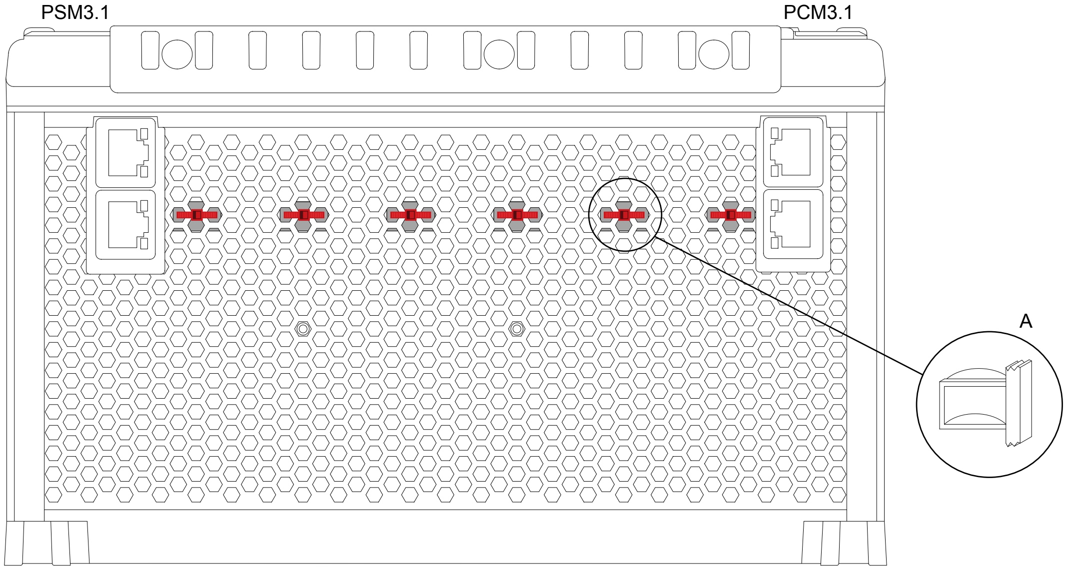


Figure 3.2 Cable tie slot positions by red cable ties (Slot detail A)



The cable tie slots are inside the rack's aluminium frame. Only use them if the maritime classification societies rules allow the wiring to be secured directly to metal. Alternatively, you can use extra insulation between the rack's frame and the wire.

3.3 Hardware modules

3.3.1 Equipment protection

NOTICE
Warranty The manufacturer's warranty will not apply if the rack has been opened by unauthorised persons. However, you are allowed to replace the battery on the PCM3.1 module. To retain the warranty, the battery must be replaced by a qualified person, and obey these instructions.

NOTICE
Correct handling of modules Failure to follow these instructions could lead to damage to the modules. Read and follow the instructions to avoid damage to the modules.

DANGER!
Hazardous live currents and voltages Hazardous live currents and voltages may be present in an installed rack. Contact with these could kill you. Only authorised personnel, who understand the precautions needed and the risks involved in working with live electrical equipment, may do this work.

CAUTION
Disrupting control Working on the rack may disrupt the control of the generator, busbar or connection. Take the necessary precautions.

CAUTION
Protecting equipment: No hot swapping Disconnect all power supplies before replacing the battery.

NOTICE
Electrostatic discharge During manufacturing and testing, the products have been kept in static shielding bags, and all personnel handling the products have been protected against static electricity and the subsequent ESD (electrostatic discharge). Be sure to carry a connection to earth when handling our PCBs.

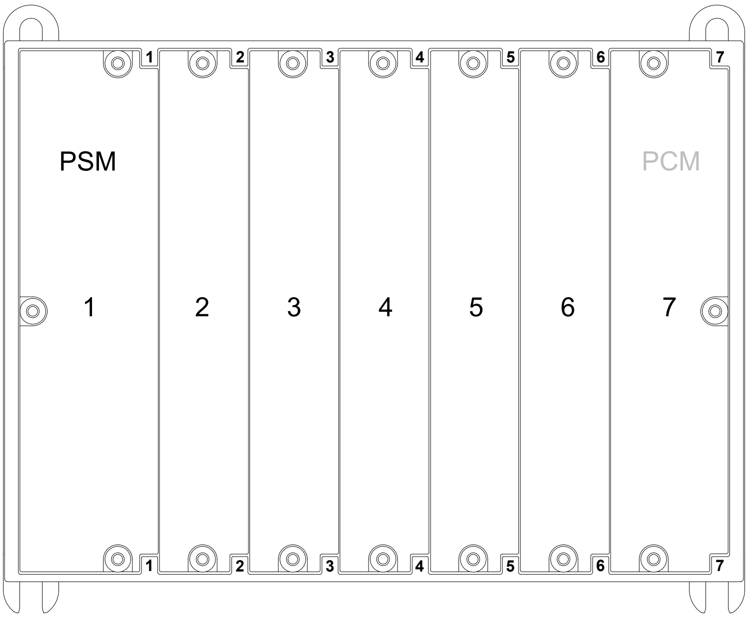
NOTICE

Torque damage to equipment

Do not use power tools during the installation/replacement. Too much torque damages the equipment.

Follow the instructions for the correct amount of torque to apply.

3.3.2 Rack slot requirements



Modules can be arranged in any order in the rack, as long as they comply with these requirements:

1. PSM3.x must be installed in slot 1.
2. PCM3.x must be installed in the last slot. If not present, the last slot can be used for other modules.
3. All other hardware modules are slotted into the rack from slot 2 onwards, without leaving any empty slots between the hardware modules. If slots are empty between the hardware modules, the modules after the empty slot(s) **cannot communicate** with the PCM module.
4. Blind modules (blank faceplates) must be installed over empty slots to protect the controller.

NOTICE

Changing module order

If you rearrange the order of the hardware modules, you will lose the modules' configuration. Always make a backup before changing hardware modules.

3.3.3 Mount or replace hardware modules

The controller is normally supplied with the hardware modules mounted. However, it is possible for you to add or replace a hardware module. If you need to add a hardware module, use the first empty slot from the left of the rack.

Each module is fastened to the rack with TX20 screws. These should be loosened before the extraction handles are used to lift the module free of the rack. They do not remove completely from the hardware module.

When mounting the modules the TX20 screws must be tightened with 0.5 N·m (4.4 lb-in).

Remove a hardware module

1. Protect the hardware modules against static discharge.
   - It is recommended to use a wrist strap connection to protect against Electrostatic discharge (ESD).
   - Test the resistance of the wrist strap and the wrist strap connection. Do not continue if the wrist strap connection is faulty. Use the wrist strap at all times while installing or uninstalling the modules.
2. Disconnect all power supplies to protect the hardware modules and personnel.
3. Remove the terminal blocks, and make sure that there are no wires in the way of removing the hardware module.
4. Disconnect any Ethernet cables from the top and bottom of the module and the plastic shielding at the ports.
5. Loosen the module faceplate screws with a TX20 screwdriver.
   - Do not force the screws to unscrew completely.
   - The screws are built-in and should remain attached to the faceplate.
6. Use pliers or your fingers to pull the faceplate screws, and carefully slide the hardware module out of the rack.
7. Hold the module by the faceplate. Do **not** touch the PCB.
8. If you want to re-use the hardware module, or send it in for testing, be careful to only handle it by its faceplate. Put the hardware module in an ESD protective package after removing it.

Mount or replace a hardware module

1. Protect the hardware modules against static discharge.
   - It is recommended to use a wrist strap connection to protect against Electrostatic discharge (ESD).
   - Test the resistance of the wrist strap and the wrist strap connection. Do not continue if the wrist strap connection is faulty. Use the wrist strap at all times while installing or uninstalling the modules.
2. Disconnect all power supplies to protect the hardware modules and personnel.
3. Open the ESD protective package, and remove the new module, holding it only by the faceplate.
4. Slide the module into the correct slot (it should slide in easily).
5. Tighten the screws on the module faceplate with a TX20 screwdriver, and 0.5 N·m (4.4 lb-in) of torque.
6. Replace all the terminal blocks, including any Ethernet cables to the module.
7. If the rack is not mounted, return the rack to its protective packaging.

4. Wiring the equipment

4.1 About the default wiring

Wiring

Only use the terminal blocks supplied by DEIF. Do not use substitutes.

Keep the foil cover placed over the top of the controller as long as possible to avoid damage to the controller.

Specifications

More information
See the **Data sheet** for the electrical specifications.

Custom configurations

The designer may specify inputs and outputs, according to the specific system's requirements. These may use the available configurable connections in the basic controller hardware, and/or the connections from additional installed modules. These connections are not included in the default wiring drawings, but must be shown on the designer's drawings for the system.

If there is space in the rack, you can mount additional modules for additional inputs and outputs. The details of these connections are specific to the installation, and must be included in the system designer's drawings.

Wire up the controller or extension rack from left to right

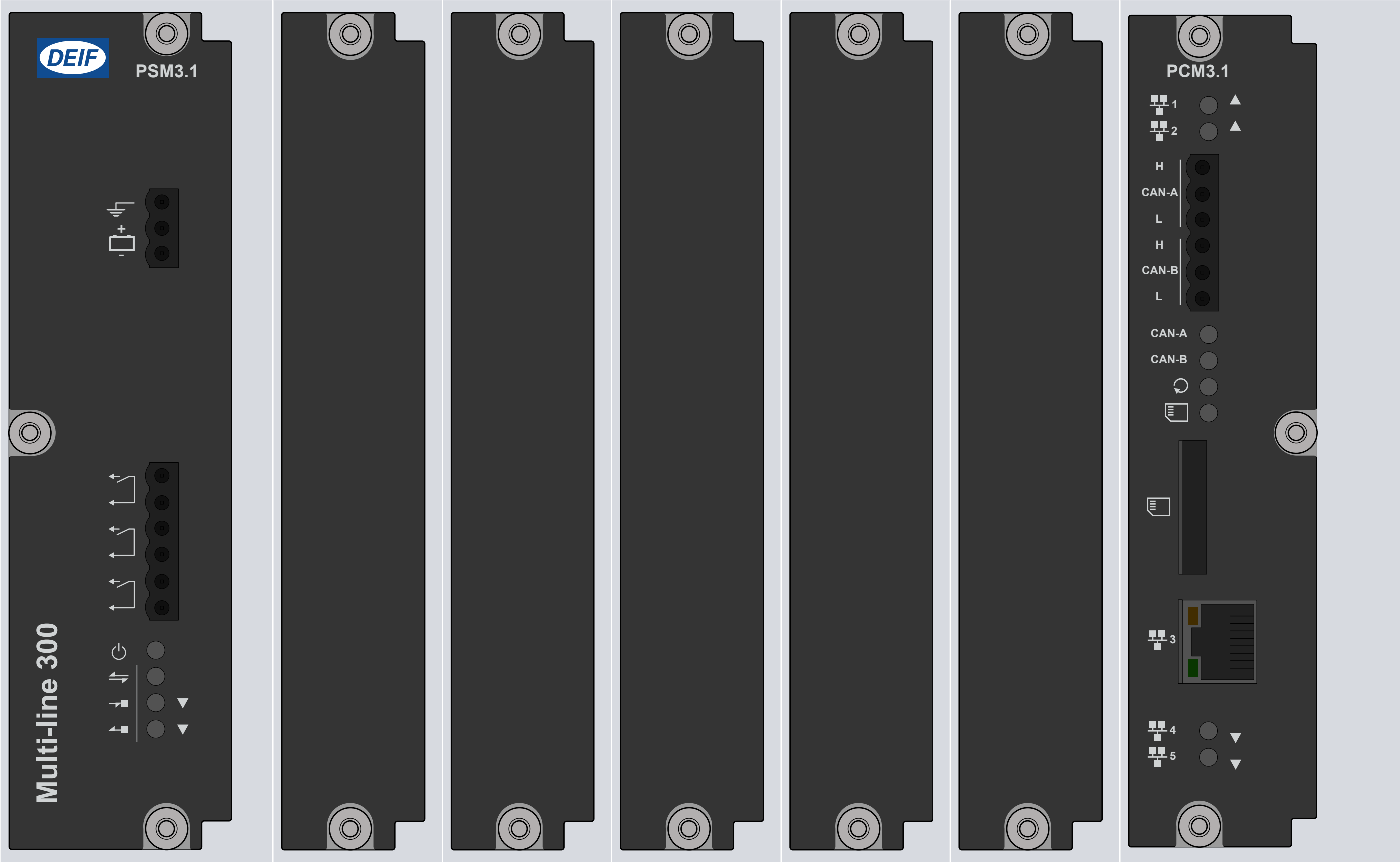
We recommend that you wire up the controller or extension rack from left to right, because the wires are located on the left side of the 45º terminal blocks.

Minimum hardware configuration

The controller minimum hardware is described below. ACM3.1, IOM3.1, IOM3.2, IOM3.3, IOM3.4 hardware modules can be ordered and installed in the empty slots. Spare hardware modules may also be ordered for installation in the field.

Table 4.1 Minimum hardware configuration in R7.1 *

Slot 1	Slot 2	Slot 3	Slot 4	Slot 5 *	Slot 6 *	Slot 7 *
PSM3.1	Blind module	Blind module	Blind module	Blind module	Blind module	PCM3.1
Power supply module						Processor and communication module



NOTE * Alternatively, use a 4-slot rack (R4.1). Slots 5, 6 and 7 are only available in a 7-slot rack (R7.1).

4.2 Encoding pins for terminals

Use encoding pins to prevent the terminal blocks from being mounted incorrectly. Make sure the terminal wiring was not swapped around during the installation, as this could lead to dangerous situations. We strongly recommend that you use encoding pins on both ACM3.1 and ACM3.2 for both voltage and current respectively. You can also use encoding pins on other terminals and modules.

Optional installation equipment

Tool	Function
Long nose pliers	Improves the handling and placement of the voltage encoding pins.

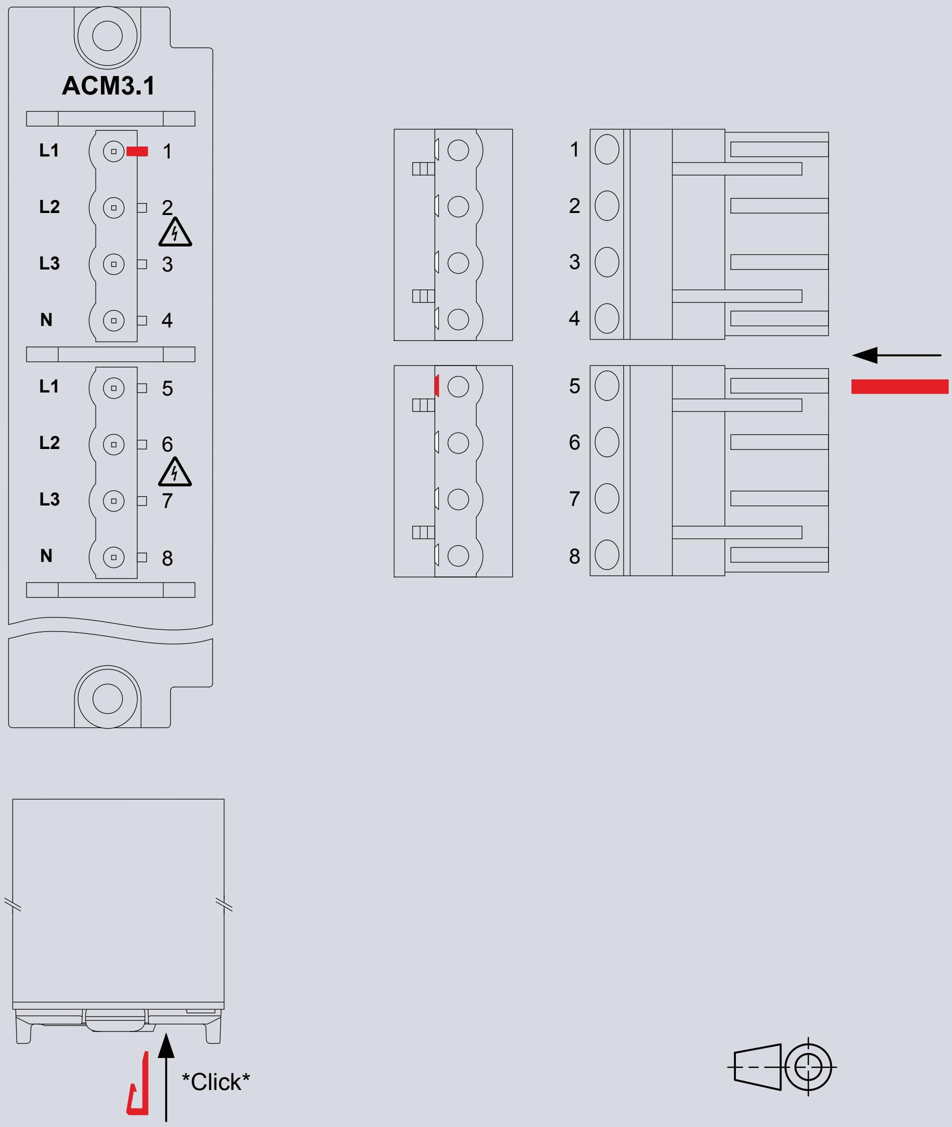
Mount encoding pins

For safety reasons the encoding pins should not be reused. Once they are installed it is difficult to remove the pins without damaging the equipment.

1. Identify the terminals where you want to place the encoding pins.
    a. For example, terminal 1 in terminal group 1-2-3-4 and terminal 5 in terminal group 5-6-7-8 on the ACM3.1 module.
2. Remove the terminal blocks from the module.
3. Place the J-shaped encoding pin in one of the slots next to a terminal pin on the module. The encoding pin is secured when you hear it click into position.

4. Slide the flat encoding pin into the groove on the terminal block of the second terminal group that matches the position of the encoding pin placed in step 3.

Example fitting voltage encoding pins to ACM3.1



4.3 Power supply module PSM3.1

4.3.1 PSM3.1 terminal connections

Term.	Symbol	Name	Type	Default
F/G		F/G	Ground	Frame ground
1		+	12 or 24 V DC (nominal)	Power supply
2		-	0 V DC	
3		Normally open	Relay output (30 V DC and 1 A)	... > *Status OK* *
4		Common		
5		Normally open		(Configurable)
6		Common		
7		Normally open		(Configurable)
8		Common		
IN		EtherCAT communication input **	RJ45 (bottom of rack, top port)	Input *
OUT		EtherCAT communication output **	RJ45 (bottom of rack, bottom port)	Output *

NOTE * Default function cannot be changed.
** EtherCAT communication connections are only for communication to extension racks.

4.3.2 Frame ground wiring

Create a protective earth:

1. Connect the frame ground terminal to the protective earth connection.
2. Connect the frame ground terminal to the cabinet.
3. Connect the rack to the cabinet.

The frame ground is connected to the power supply terminals through transient voltage suppression diodes (transorbs). In order to protect the frame ground and power supply, max. 36 V is allowed between the frame ground and the power supply terminals.

4.3.3 Power supply wiring

Connect the power supply (+) to the 12 or 24 V DC power supply, and the power supply (-) to the 0 V DC power supply.

NOTICE
Negative power supply terminal Do not wire the negative power supply terminal of the modules with independent power supplies (for example, PSM 3.1) to the single-phase ground. If the voltage between the power supply terminals and frame ground exceeds 36 V, the power supply terminals and the frame ground terminal will be damaged.

Figure 4.1 Recommended wiring for the power supply

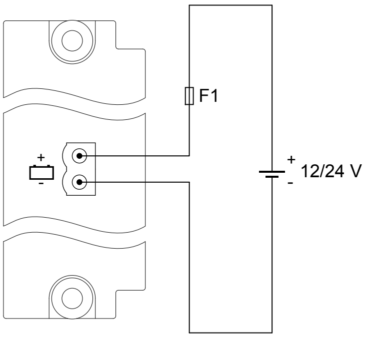
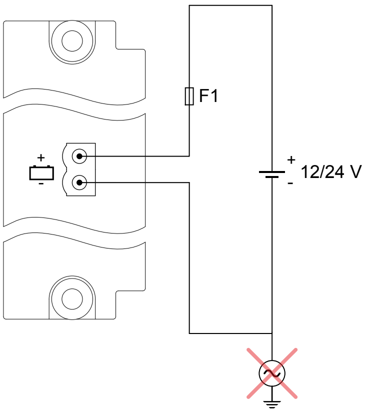


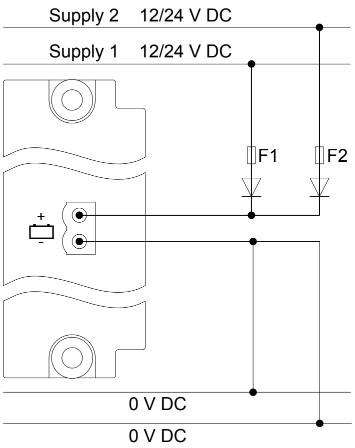
Figure 4.2 Incorrect wiring of the power supply



Backup power supply

The equipment does not contain a backup power supply. The power supply source must therefore include the necessary power backup.

Figure 4.3 Example of a power supply and backup connected to the power supply terminals

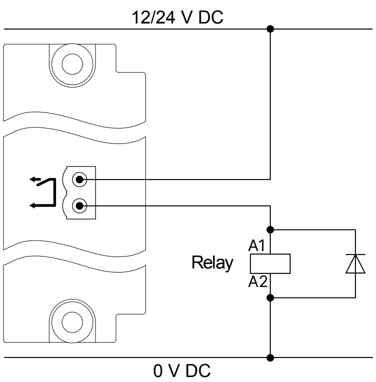


We recommend a 2 A time-delay fuse for 24 V DC and a 4 A time-delay fuse for 12 V DC for F1 and F2, and that the diodes are rated 50V or higher.

NOTICE
Nominal auxiliary voltage is 12 or 24V DC (8 to 36 V DC operating range). If voltage drops (load dumps) are likely to appear, a 7 A time-delay fuse is needed.

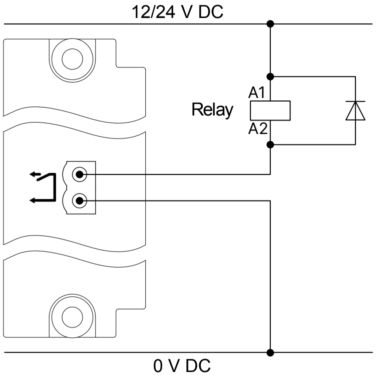
4.3.4 Relay output wiring

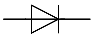
The diagram shows the connection of the relay output to an external relay. There is no voltage on the external relay when the controller relay is open.



Use a diode size as recommended by the relay supplier.

You can swap the terminal connections around without affecting the performance.

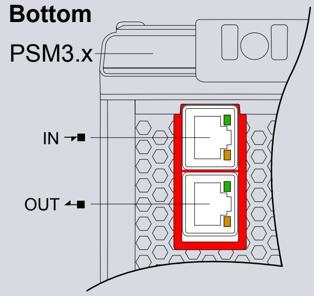


Install a freewheeling diode () to prevent a sudden voltage spike across the inductive load when the voltage source is removed.

4.3.5 PSM3.1 EtherCAT connections

Extension racks are connected to controller with the EtherCAT communication ports on the PSM3.1 and PSM3.2. These ports are marked in red on the controller and extension rack.

Table 4.2 Location of the EtherCAT communication ports

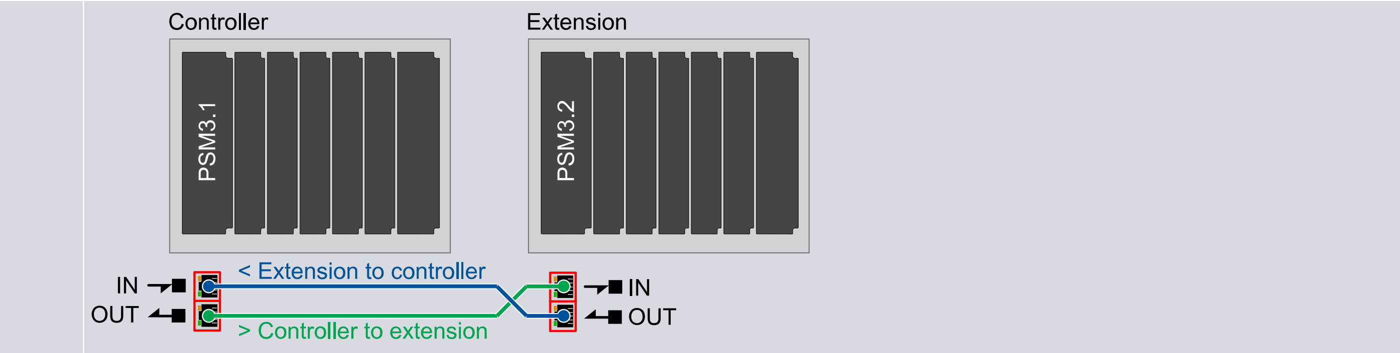
Symbol	Symbol	Port location	Notes
	IN	Bottom of rack, top port	**EtherCAT communication:** IN port from other rack.
	OUT	Bottom of rack, bottom port	**EtherCAT communication:** OUT port to other rack.

EtherCAT communication restrictions

The racks have an OUT port and an IN port for EtherCAT communication. The OUT port must always be connected to an IN port on the next extension rack.

- With 1 extension rack, you can optionally create a ring network by connecting the last extension rack back to the controller.
- With 2 or more extension racks, you must create a ring network by connecting the last extension rack back to the controller.
- Number of extension racks is limited by EtherCAT data amount and cycle time.
- The cables must not be longer than 100 metres from point-to-point.
- The cables must meet or exceed the SF/UTP CAT5e specification.
- Controller and extension rack must be connected directly without a switch between them.

How to connect a ring connection
The controller is connected to the extension rack. The extension rack is connected back to the controller.



Power off the extension racks before you exchange or re-connect them to another controller.

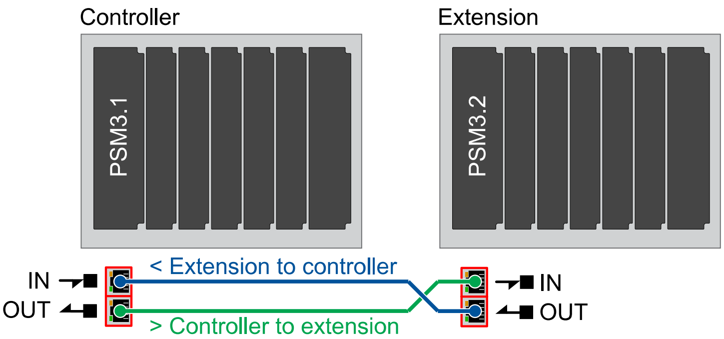
Cable bend radius

Bends in the Ethernet cables must not be tighter than the minimum bend radius specified by the cable manufacturers. We recommend that you always follow the cable manufacturer's bend radius requirements. It is recommended to use velcro-strips and not cable-ties for the Ethernet cables.

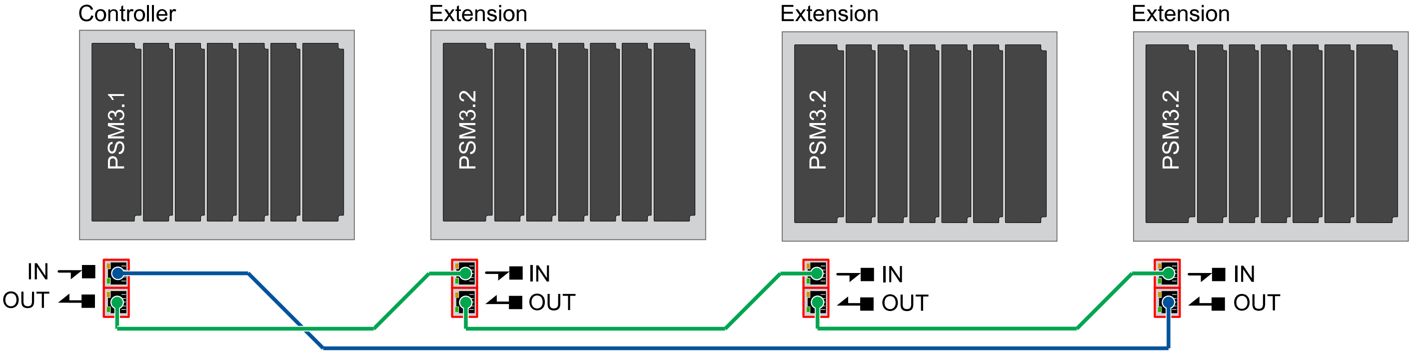
4.3.6 Topology examples

EtherCAT communication must be connected only in a chain or ring configuration. Ring configuration provides redundant communication, should one connection be damaged.

Chain (single connection)



Ring (redundancy connection)



4.4 Power supply module PSM3.2 (Extension rack)

4.4.1 PSM3.2 terminal connections

Term.	Symbol	Name	Type	Default
F/G		F/G	Ground	Frame ground
1		+	12 or 24 V DC (nominal)	Power supply
2		-	0 V DC	
3		Normally open	Relay output (30 V DC and 1 A)	Configurable
4		Common		
5		Normally open		Configurable
6		Common		
7		Normally open		Configurable
8		Common		
IN		EtherCAT communication input **	RJ45 (bottom of rack, top port)	Input *
OUT		EtherCAT communication output **	RJ45 (bottom of rack, bottom port)	Output *

NOTE * Default function cannot be changed.
** EtherCAT communication connections are only for communication to extension racks.

4.4.2 Frame ground wiring

Create a protective earth:

1. Connect the frame ground terminal to the protective earth connection.
2. Connect the frame ground terminal to the cabinet.
3. Connect the rack to the cabinet.

The frame ground is connected to the power supply terminals through transient voltage suppression diodes (transorbs). In order to protect the frame ground and power supply, max. 36 V is allowed between the frame ground and the power supply terminals.

4.4.3 Power supply wiring

Connect the power supply (+) to the 12 or 24 V DC power supply, and the power supply (-) to the 0 V DC power supply.

NOTICE
Negative power supply terminal Do not wire the negative power supply terminal of the modules with independent power supplies (for example, PSM 3.1) to the single-phase ground. If the voltage between the power supply terminals and frame ground exceeds 36 V, the power supply terminals and the frame ground terminal will be damaged.

Figure 4.4 Recommended wiring for the power supply

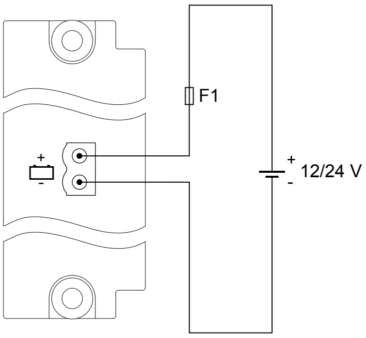
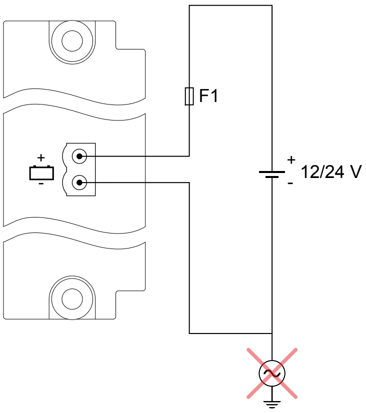


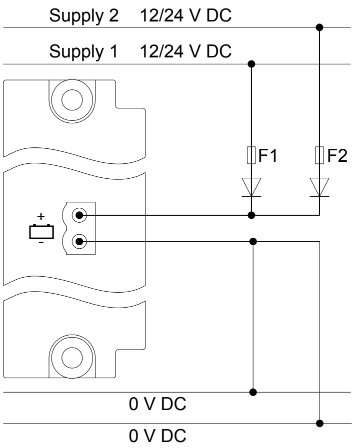
Figure 4.5 Incorrect wiring of the power supply



Backup power supply

The equipment does not contain a backup power supply. The power supply source must therefore include the necessary power backup.

Figure 4.6 Example of a power supply and backup connected to the power supply terminals

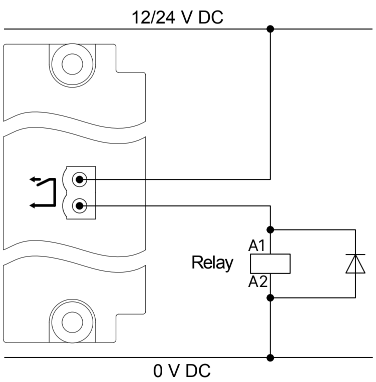


We recommend a 2 A time-delay fuse for 24 V DC and a 4 A time-delay fuse for 12 V DC for F1 and F2, and that the diodes are rated 50V or higher.

NOTICE
Nominal auxiliary voltage is 12 or 24V DC (8 to 36 V DC operating range). If voltage drops (load dumps) are likely to appear, a 7 A time-delay fuse is needed.

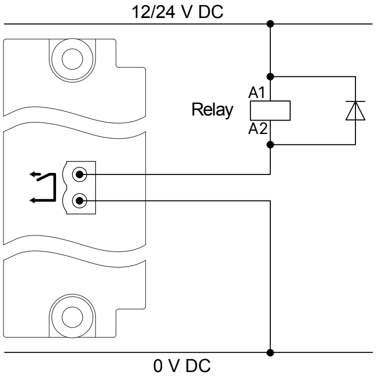
4.4.4 Relay output wiring

The diagram shows the connection of the relay output to an external relay. There is no voltage on the external relay when the controller relay is open.



Use a diode size as recommended by the relay supplier.

You can swap the terminal connections around without affecting the performance.

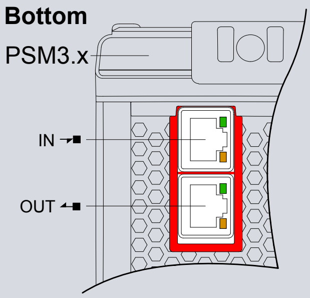


Install a freewheeling diode ( ) to prevent a sudden voltage spike across the inductive load when the voltage source is removed.

4.4.5 PSM3.1 EtherCAT connections

Extension racks are connected to controller with the EtherCAT communication ports on the PSM3.1 and PSM3.2. These ports are marked in red on the controller and extension rack.

Table 4.3 Location of the EtherCAT communication ports

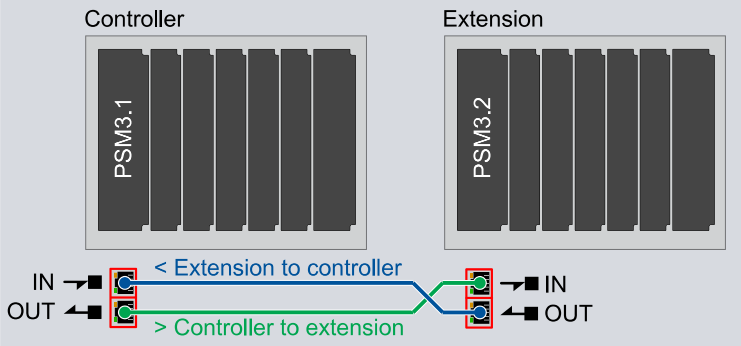
Symbol	Symbol	Port location	Notes
	IN	Bottom of rack, top port	**EtherCAT communication:** IN port from other rack.
	OUT	Bottom of rack, bottom port	**EtherCAT communication:** OUT port to other rack.

EtherCAT communication restrictions

The racks have an OUT port and an IN port for EtherCAT communication. The OUT port must always be connected to an IN port on the next extension rack.

- With 1 extension rack, you can optionally create a ring network by connecting the last extension rack back to the controller.
- With 2 or more extension racks, you must create a ring network by connecting the last extension rack back to the controller.
- Number of extension racks is limited by EtherCAT data amount and cycle time.
- The cables must not be longer than 100 metres from point-to-point.
- The cables must meet or exceed the SF/UTP CAT5e specification.
- Controller and extension rack must be connected directly without a switch between them.

How to connect a ring connection
The controller is connected to the extension rack. The extension rack is connected back to the controller.



Power off the extension racks before you exchange or re-connect them to another controller.

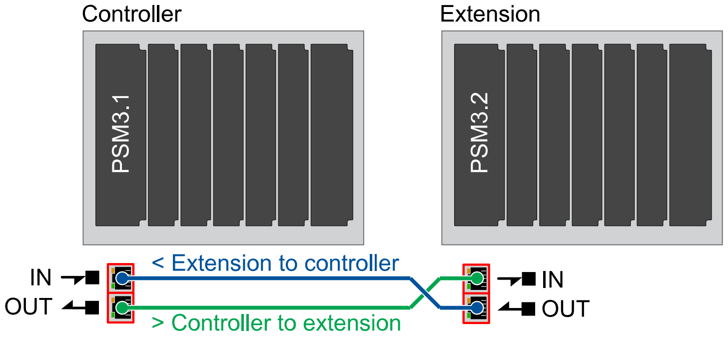
Cable bend radius

Bends in the Ethernet cables must not be tighter than the minimum bend radius specified by the cable manufacturers. We recommend that you always follow the cable manufacturer's bend radius requirements. It is recommended to use velcro-strips and not cable-ties for the Ethernet cables.

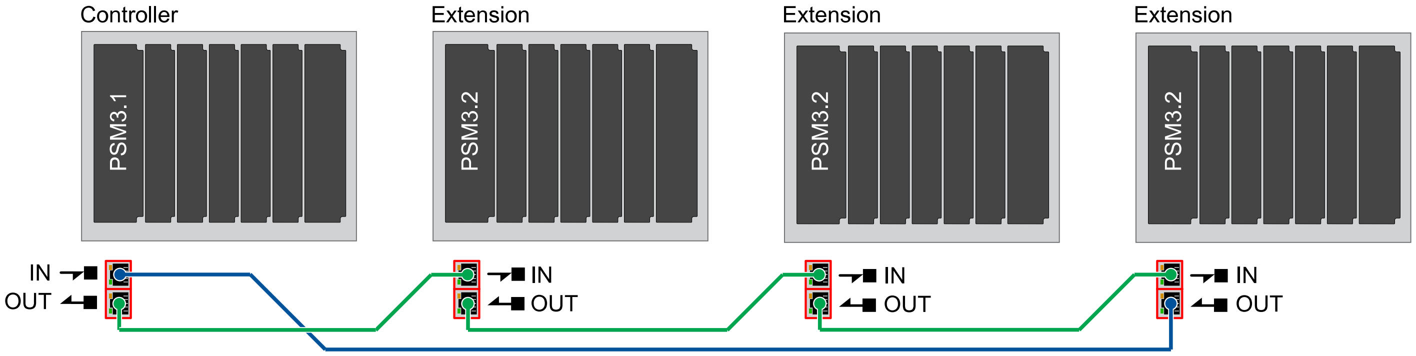
4.4.6 Topology examples

EtherCAT communication must be connected only in a chain or ring configuration. Ring configuration provides redundant communication, should one connection be damaged.

Chain (single connection)

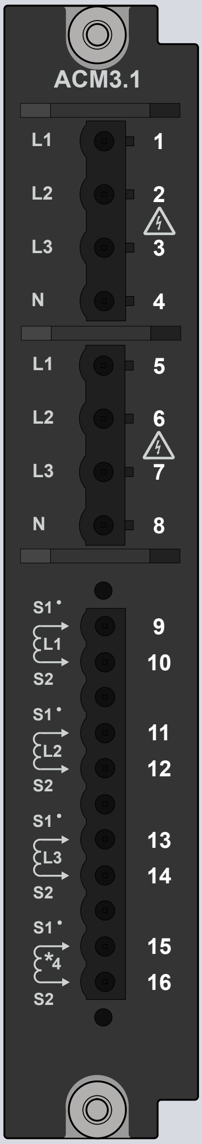


Ring (redundancy connection)



4.5 Alternating current module ACM3.1

4.5.1 ACM3.1 terminal connections



Term.	Symbol	Name	Type	Default
1	L1	L1 voltage	Voltage ** 100 to 690 V AC phase-to-phase (nominal)	[Busbar] L1
2	L2	L2 voltage		[Busbar] L2
3	L3	L3 voltage		[Busbar] L3
4	N	N voltage		Optional *
5	L1	L1 voltage	Voltage ** 100 to 690 V AC phase-to-phase (nominal)	[Source] L1
6	L2	L2 voltage		[Source] L2
7	L3	L3 voltage		[Source] L3
8	N	N voltage		Optional
9	S1•	Current in (Europe: S1; US: •)	Current 1 or 5 A AC (nominal)	[Source] L1
10	S2	Current out (Europe: S2)		
11	S1•	Current in (Europe: S1; US: •)	Current 1 or 5 A AC (nominal)	[Source] L2
12	S2	Current out (Europe: S2)		
13	S1•	Current in (Europe: S1; US: •)	Current 1 or 5 A AC (nominal)	[Source] L3
14	S2	Current out (Europe: S2)		
15	S1•	Current in (Europe: S1; US: •)	Current 1 or 5 A AC (nominal)	Configurable
16	S2	Current out (Europe: S2)		

NOTE * The Neutral terminal must only be wired if it is available on both the [Busbar] and the [Source]. If neutral is wired on just one side it could cause an error during synchronisation.

** The two sets of voltage measurements must not be swapped around. The controller uses the second set of voltage measurements together with the current measurements for a number of calculations. We recommend to fit encoding pins to the voltage measurement terminals.

DANGER!

Do not connect or disconnect a CT with live current present

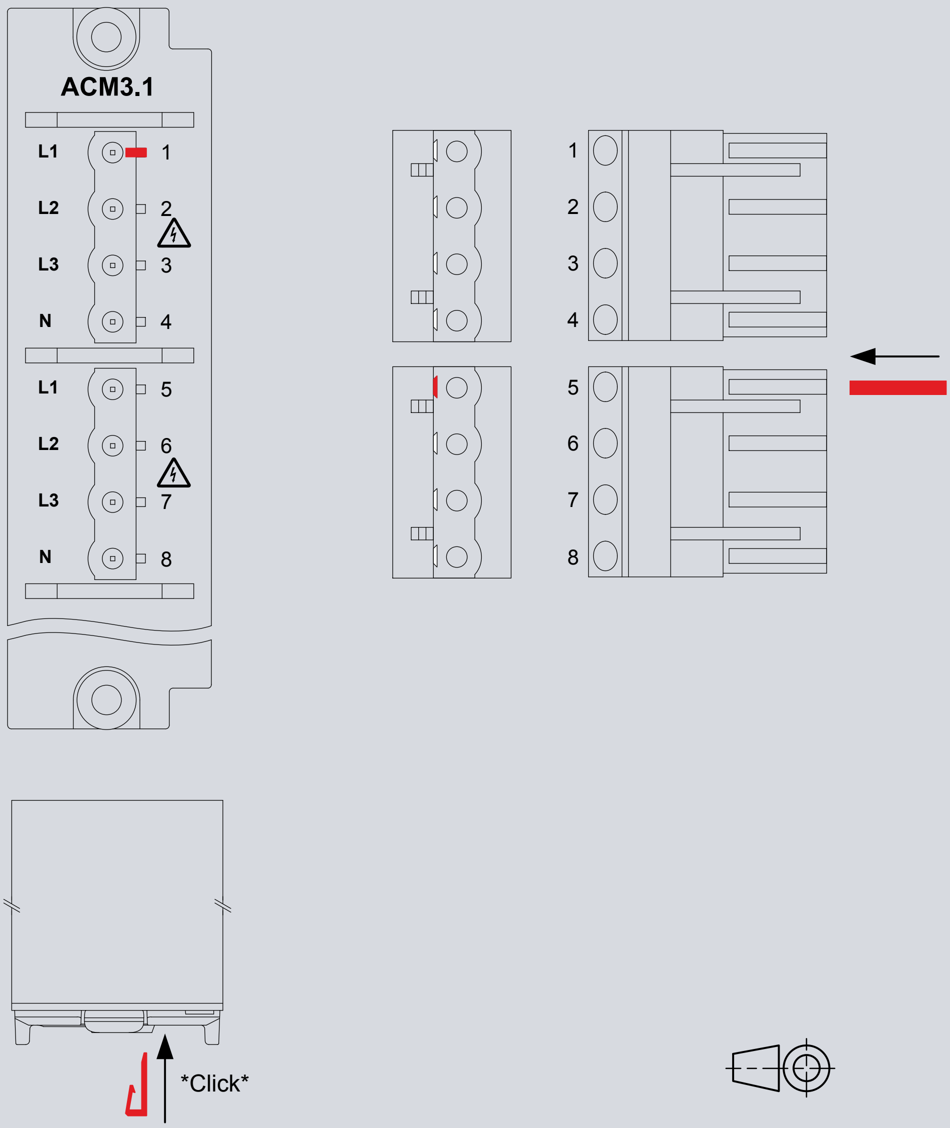
The current measurement terminal block must always be screwed onto the module.

Do not connect or disconnect any current transformer (CT) while there is current in the line.

4.5.2 Voltage encoding pins for ACM3.1

We strongly recommend the use of encoding pins on the voltage terminals of the ACM3.1.

Example fitting voltage encoding pins to ACM3.1



4.5.3 Voltage measurements wiring

We recommend that you install fuses (2 A rating) on the voltage measurement lines, as close to the busbar as possible, to protect the voltage measurement lines.

4.5.4 Current measurements wiring

The current inputs are galvanically separated.

Mount each current transformer and connect it to the controller terminals so that each measurement current flows through the controller in the correct direction. Incorrect mounting and wiring causes faulty current measurements (see the controller wiring diagrams for the correct mounting direction and wiring).

DANGER!

Do not connect or disconnect a CT with live current present

If a CT is disconnected when there is current in the line, a high voltage is generated across the secondary of the CT. This can cause arcing, personal injury or death, or damage to the controller.

The current measurement terminal block must always be screwed onto the module. Do not connect or disconnect any current transformer (CT) while there is current in the line.

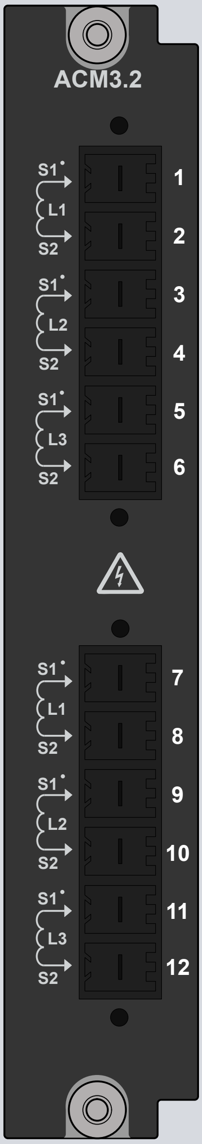
The current measurement terminal block must always be screwed onto the module. If for some reason the terminal block is unscrewed, secure it using a 0.25 N·m (2.2 lb-in) torque screwdriver with a 3.5 mm (0.14 in) flat-bladed bit.

4.5.5 Power transformer

More information
See **Designer's handbook** for how to configure the Power transformer settings.

4.6 Differential current module ACM3.2

4.6.1 ACM3.2 terminal connections

	Term.	Symbol	Name	Type	Default
	1	S1• S2	Current in (Europe: S1; US: •)	Current * 1 or 5 A AC (nominal)	Consumer side L1
	2		Current out (Europe: S2)		
	3	S1• S2	Current in (Europe: S1; US: •)	Current * 1 or 5 A AC (nominal)	Consumer side L2
	4		Current out (Europe: S2)		
	5	S1• S2	Current in (Europe: S1; US: •)	Current * 1 or 5 A AC (nominal)	Consumer side L3
	6		Current out (Europe: S2)		
	7	S1• S2	Current in (Europe: S1; US: •)	Current * 1 or 5 A AC (nominal)	Neutral side L1
	8		Current out (Europe: S2)		
	9	S1• S2	Current in (Europe: S1; US: •)	Current * 1 or 5 A AC (nominal)	Neutral side L2
	10		Current out (Europe: S2)		
	11	S1• S2	Current in (Europe: S1; US: •)	Current * 1 or 5 A AC (nominal)	Neutral side L3
	12		Current out (Europe: S2)		

NOTE * The two sets of current measurements must not be swapped around.

More information
See **AC configuration and nominal settings** in the **Designer's handbook** for how to change the reference direction of the current transformer.

DANGER!

Do not connect or disconnect a CT with live current present

If a CT is disconnected when there is current in the line, a high voltage is generated across the secondary of the CT. This can cause arcing, personal injury or death, or damage to the controller.

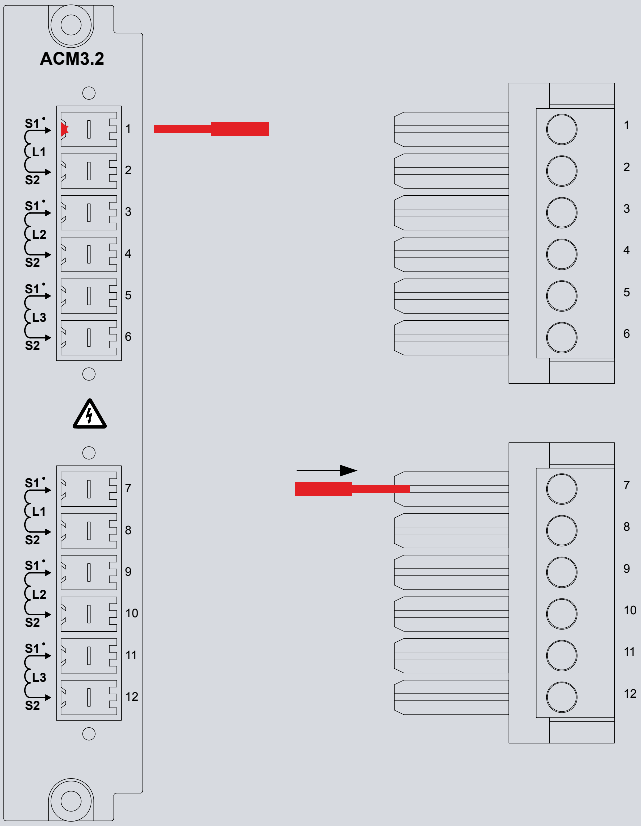
The current measurement terminal block must always be screwed onto the module. Do not connect or disconnect any current transformer (CT) while there is current in the line.

4.6.2 Current encoding pins for ACM3.2

We strongly recommend the use of encoding pins on the current terminals of the ACM3.2.

Example fitting voltage encoding pins to ACM3.2

The encoding pins for the ACM3.2 are not the same as the encoding pins for voltage on the ACM3.1 or other terminals.



4.6.3 Current measurements wiring

By default the direction of the current transformers are towards the protected area (as shown in the default wiring). If the direction of the current transformers is not the same as the default direction, then the *Current reference dir.* parameter must be update to be the same as the direction of the installed current transformer.

The current inputs are galvanically separated.

Mount each current transformer and connect it to the controller terminals so that each measurement current flows through the controller in the correct direction. Incorrect mounting and wiring causes faulty current measurements (see the controller wiring diagrams for the correct mounting direction and wiring).

DANGER!

Do not connect or disconnect a CT with live current present

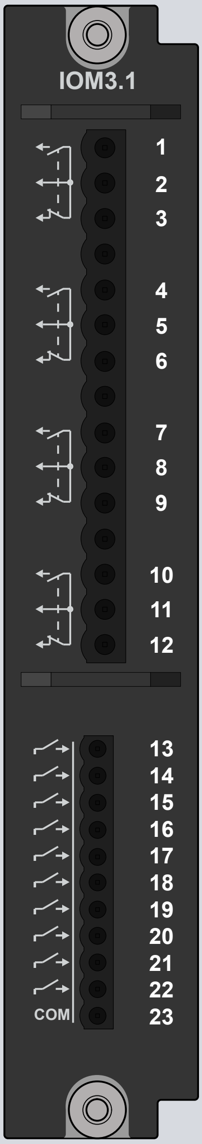
If a CT is disconnected when there is current in the line, a high voltage is generated across the secondary of the CT. This can cause arcing, personal injury or death, or damage to the controller.

The current measurement terminal block must always be screwed onto the module. Do not connect or disconnect any current transformer (CT) while there is current in the line.

The current measurement terminal block must always be screwed onto the module. If for some reason the terminal block is unscrewed, secure it using a 0.25 N·m (2.2 lb-in) torque screwdriver with a 3.5 mm (0.14 in) flat-bladed bit.

4.7 Input/output module IOM3.1

4.7.1 IOM3.1 terminal connections



Term.	Symbol	Name	Type	Default
1		Normally open		
2		Common	Relay output (250 V AC or 30 V DC, and 6 A)	Configurable
3		Normally closed		
4		Normally open		
5		Common	Relay output (250 V AC or 30 V DC, and 6 A)	Configurable
6		Normally closed		
7		Normally open		
8		Common	Relay output (250 V AC or 30 V DC, and 6 A)	Configurable
9		Normally closed		
10		Normally open		
11		Common	Relay output (250 V AC or 30 V DC, and 6 A)	Configurable
12		Normally closed		
13		Bi-directional input	Digital input (OFF: 0 to 2 V DC, ON: 8 to 36 V DC, Impedance: 4.7 kΩ)	Configurable
14		Bi-directional input	Digital input (OFF: 0 to 2 V DC, ON: 8 to 36 V DC, Impedance: 4.7 kΩ)	Configurable
15		Bi-directional input	Digital input (OFF: 0 to 2 V DC, ON: 8 to 36 V DC, Impedance: 4.7 kΩ)	Configurable
16		Bi-directional input	Digital input (OFF: 0 to 2 V DC, ON: 8 to 36 V DC, Impedance: 4.7 kΩ)	Configurable
17		Bi-directional input	Digital input (OFF: 0 to 2 V DC, ON: 8 to 36 V DC, Impedance: 4.7 kΩ)	Configurable
18		Bi-directional input	Digital input (OFF: 0 to 2 V DC, ON: 8 to 36 V DC, Impedance: 4.7 kΩ)	Configurable
19		Bi-directional input	Digital input (OFF: 0 to 2 V DC, ON: 8 to 36 V DC, Impedance: 4.7 kΩ)	Configurable
20		Bi-directional input	Digital input (OFF: 0 to 2 V DC, ON: 8 to 36 V DC, Impedance: 4.7 kΩ)	Configurable
21		Bi-directional input	Digital input (OFF: 0 to 2 V DC, ON: 8 to 36 V DC, Impedance: 4.7 kΩ)	Configurable
22		Bi-directional input	Digital input (OFF: 0 to 2 V DC, ON: 8 to 36 V DC, Impedance: 4.7 kΩ)	Configurable
23	COM	Common	Digital input	

4.7.2 Relay output wiring (changeover)

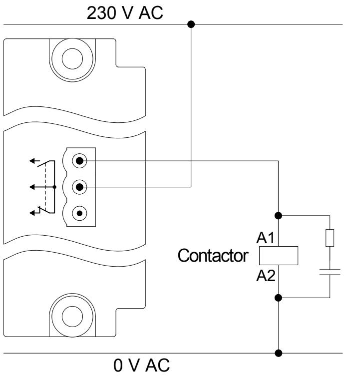
This changeover relay has three terminals: normally closed, common and normally open. You can connect wiring to:

- All three terminals

- Common and normally open terminals
- Common and normally closed terminals

Connection to Normally open and common terminals

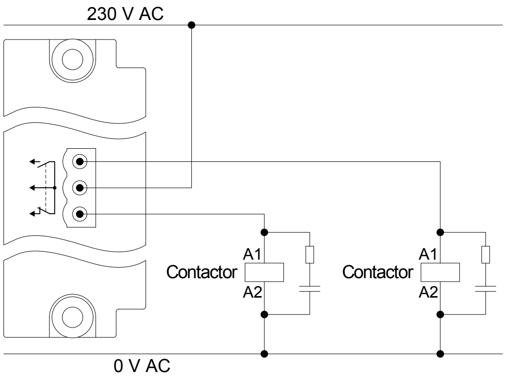
Relay output connected to a 230 V AC contactor. You can swap the terminal connections around without affecting the performance.



Similarly, you can connect equipment to the normally closed terminal and common.

Connection to all three terminals

For this configuration, current flows through the equipment connected to the normally closed terminal when the relay is de-energised. The current flows through the equipment connected to the normally open terminal when the relay is energised.



For 230 V AC contactors, we strongly recommend that you use an RC snubber for noise suppression across the contactor.

4.7.3 Digital input wiring

The digital inputs are bi-directional, so you can swap the terminal connections around without affecting the performance..

However, all the digital inputs in a group share a common terminal. The digital input common for a module may be either low (connected to 0 V), or high (connected to 12 or 24 V):

- If common is low: All the digital input signals connected to the group must be high (connected to 12 or 24 V).
- If common is high: All the digital input signals connected to the group must be low (connected to 0 V).

The digital input common is not used as the common for any of the other terminals on the same hardware module. The digital input common is also not affected by the digital input commons on other hardware modules.

Figure 4.7 Example: Digital input wiring (common = 0 V)

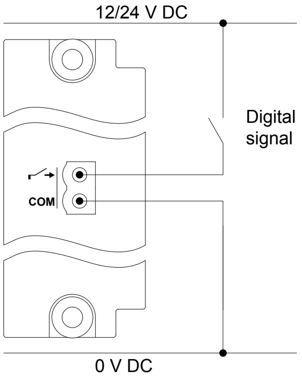
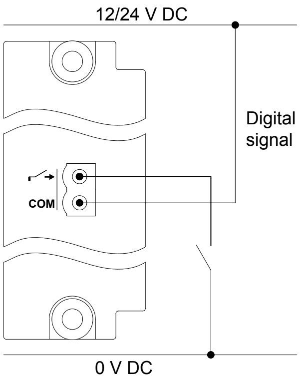


Figure 4.8 Example: Digital input wiring (common = 12 or 24 V)



Safety function wiring

Safety functions, for example, *Emergency stop*, require a normally closed digital signal to be wired to the controller.

Figure 4.9 Example: Digital input wiring for safety functions (common = 0 V)

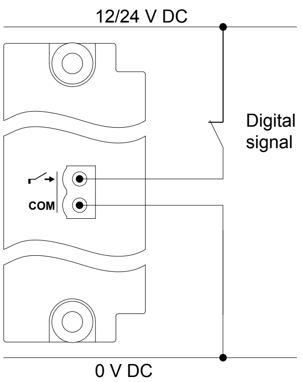
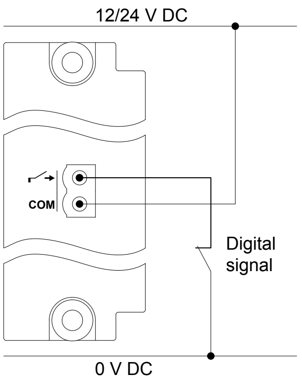


Figure 4.10 Example: Digital input wiring for safety functions (common = 12 or 24 V)



Compliance with EN60255-26

If the wire to an open contact is over 10 m long, then additional measures are required for compliance with EN60255-26. You can use a 1 kΩ resistor to common, or you can use a twisted or shielded wire to the open contact.

Figure 4.11 Example: 1 kΩ resistor to common for compliance with EN60255-26

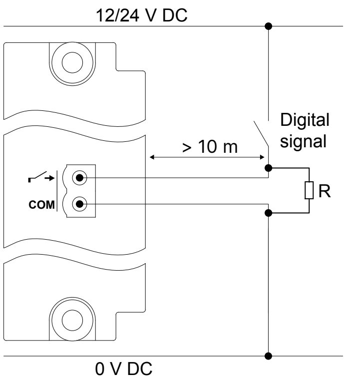


Figure 4.12 Example: Twisted wire for compliance with EN60255-26

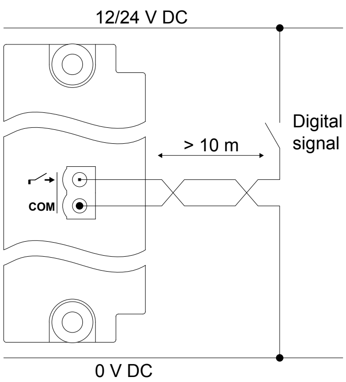


Figure 4.13 Example: Shielded wire for compliance with EN60255-26

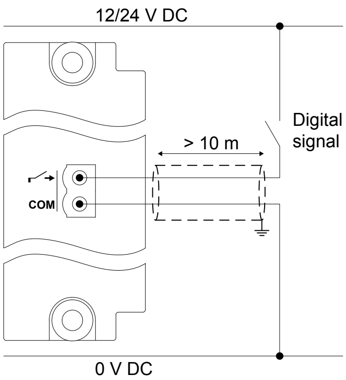
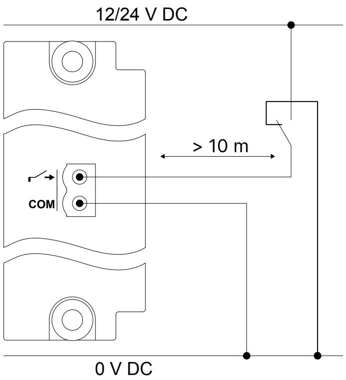


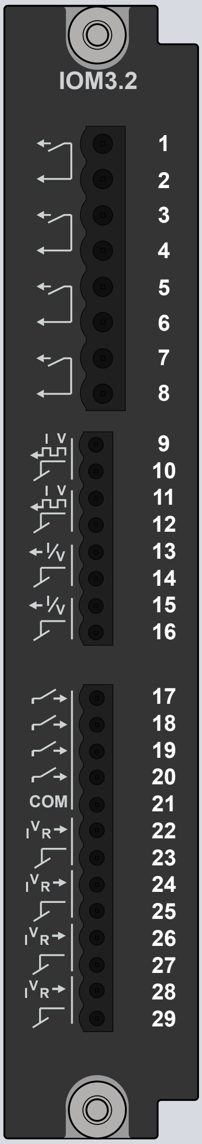
Figure 4.14 Example: Closed contact for compliance with EN60255-26



4.8 Input/output module IOM3.2

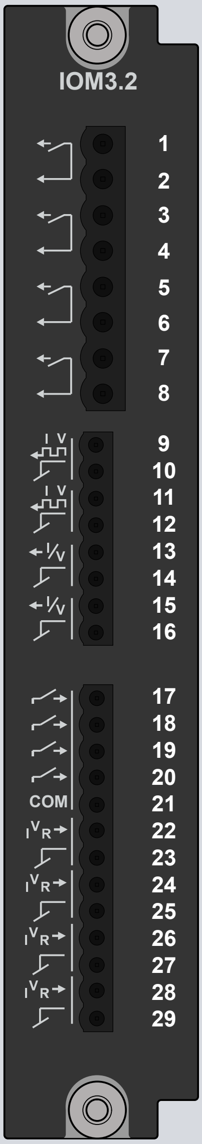
4.8.1 IOM3.2 terminal connections

Table 4.4 IOM3.2 Relay outputs (1 to 8) and Analogue multifunctional outputs (9 to 16)



Term	Symbol	Name	Type	Default
1		Normally open	Relay output (30 V DC and 6 A)	Configurable
2		Common		
3		Normally open	Relay output (30 V DC and 6 A)	Configurable
4		Common		
5		Normally open	Relay output (30 V DC and 6 A)	Configurable
6		Common		
7		Normally open	Relay output (30 V DC and 6 A)	Configurable
8		Common		
9		Analogue output	Analogue current output (-25 to 25 mA DC) Analogue voltage output (-10 to 10 V DC) Analogue PWM output (1 to 2500 Hz)	Configurable
10		Common		
11		Analogue output	Analogue current output (-25 to 25 mA DC) Analogue voltage output (-10 to 10 V DC) Analogue PWM output (1 to 2500 Hz)	Configurable
12		Common		
13		Analogue output	Analogue current output (-25 to 25 mA DC) Analogue voltage output (-10 to 10 V DC)	Configurable
14		Common		
15		Analogue output	Analogue current output (-25 to 25 mA DC) Analogue voltage output (-10 to 10 V DC)	Configurable
16		Common		

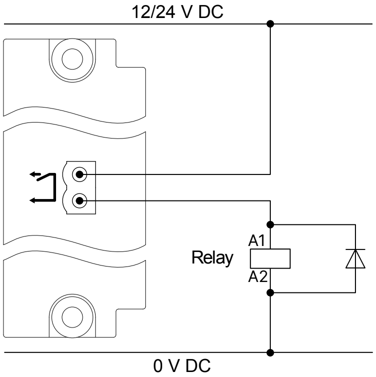
Table 4.5 IOM3.2 Digital inputs (17 to 21) and Analogue multifunctional inputs (22 to 29)



Term.	Symbol	Name	Type	Default
17		Bi-directional input	Digital input (OFF: -2 to 2 V DC, ON: -36 to -8 V DC or 8 to 36 V DC, Impedance: 3.9 kΩ)	Configurable
18		Bi-directional input	Digital input (OFF: -2 to 2 V DC, ON: -36 to -8 V DC or 8 to 36 V DC, Impedance: 3.9 kΩ)	Configurable
19		Bi-directional input	Digital input (OFF: -2 to 2 V DC, ON: -36 to -8 V DC or 8 to 36 V DC, Impedance: 3.9 kΩ)	Configurable
20		Bi-directional input	Digital input (OFF: -2 to 2 V DC, ON: -36 to -8 V DC or 8 to 36 V DC, Impedance: 3.9 kΩ)	Configurable
21	COM	Common		-
22		Analogue input	Current input (0 to 20 mA or 4 to 20 mA) Voltage input (-10 to 10 V DC or 0 to 10 V DC) RMI 1 or 2 wire (0 to 4.5 kΩ) Pt100 (-200 to 850 °C) Pt1000 (-200 to 850 °C) Thermocouple (E: -200 to 1000 °C, J: -210 to 1200 °C, K: -200 to 1372 °C, N: -200 to 1300 °C, R: -50 to 1768 °C, S: -50 to 1768 °C, T: -200 to 400 °C)	Configurable
23		Common		
24		Analogue input	Current input (0 to 20 mA or 4 to 20 mA) Voltage input (-10 to 10 V DC or 0 to 10 V DC) RMI 1 or 2 wire (0 to 4.5 kΩ) Pt100 (-200 to 850 °C) Pt1000 (-200 to 850 °C) Thermocouple (E: -200 to 1000 °C, J: -210 to 1200 °C, K: -200 to 1372 °C, N: -200 to 1300 °C, R: -50 to 1768 °C, S: -50 to 1768 °C, T: -200 to 400 °C)	Configurable
25		Common		
26		Analogue input	Current input (0 to 20 mA or 4 to 20 mA) Voltage input (-10 to 10 V DC or 0 to 10 V DC) RMI 1 or 2 wire (0 to 4.5 kΩ) Pt100 (-200 to 850 °C) Pt1000 (-200 to 850 °C) Thermocouple (E: -200 to 1000 °C, J: -210 to 1200 °C, K: -200 to 1372 °C, N: -200 to 1300 °C, R: -50 to 1768 °C, S: -50 to 1768 °C, T: -200 to 400 °C)	Configurable
27		Common		
28		Analogue input	Current input (0 to 20 mA or 4 to 20 mA) Voltage input (-10 to 10 V DC or 0 to 10 V DC) RMI 1 or 2 wire (0 to 4.5 kΩ) Pt100 (-200 to 850 °C) Pt1000 (-200 to 850 °C) Thermocouple (E: -200 to 1000 °C, J: -210 to 1200 °C, K: -200 to 1372 °C, N: -200 to 1300 °C, R: -50 to 1768 °C, S: -50 to 1768 °C, T: -200 to 400 °C)	Configurable
29		Common		

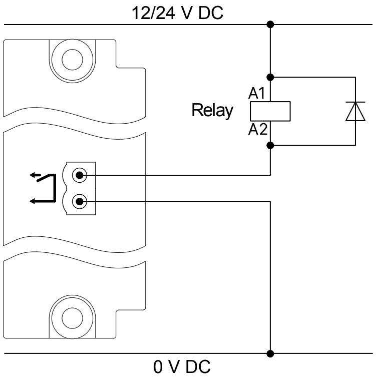
4.8.2 Relay output wiring

The diagram shows the connection of the relay output to an external relay. There is no voltage on the external relay when the controller relay is open.



Use a diode size as recommended by the relay supplier.

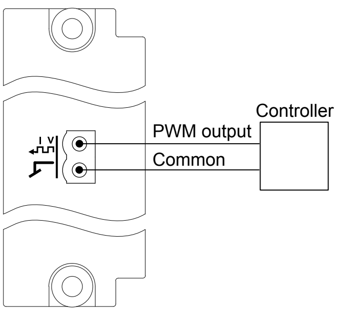
You can swap the terminal connections around without affecting the performance.



Install a freewheeling diode ( ) to prevent a sudden voltage spike across the inductive load when the voltage source is removed.

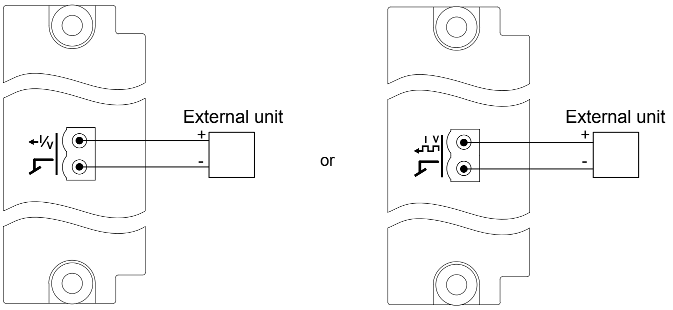
4.8.3 Pulse width modulation (PWM) output wiring (terminals 9-10 or 11-12 only)

Pulse width modulation (PWM) output is normally used to control a governor. The PWM could also be used as an input for another controller, as shown in the diagram below. PWM wiring can only be made to terminals 9 and 10, or 11 and 12.



4.8.4 Analogue multifunctional current or voltage outputs wiring

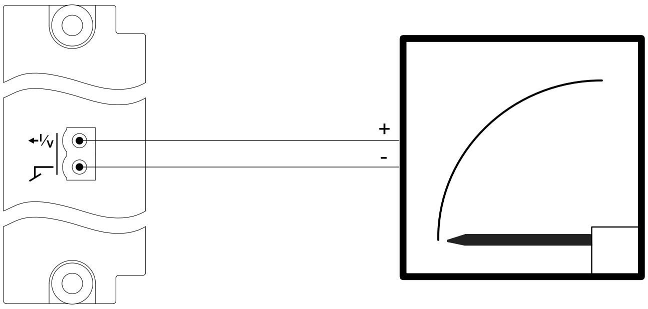
The diagram below shows the connection of an external controller to the DEIF controller's analogue current or voltage output. The I/O configuration determines whether the output is current or voltage.



NOTICE
Terminal damage These outputs are active outputs. Do not connect an external power supply to these terminals. Connecting an external power supply may damage the terminals.

Using an analogue output with an external instrument

The analogue output can be connected directly to a 4 to 20 mA external instrument:



DEIF recommends using instruments from the DEIF DQ moving coil instrument series. See http://www.deif.com for more information.

4.8.5 Digital input wiring

The digital inputs are bi-directional, so you can swap the terminal connections around without affecting the performance..

However, all the digital inputs in a group share a common terminal. The digital input common for a module may be either low (connected to 0 V), or high (connected to 12 or 24 V):

- If common is low: All the digital input signals connected to the group must be high (connected to 12 or 24 V).
- If common is high: All the digital input signals connected to the group must be low (connected to 0 V).

The digital input common is not used as the common for any of the other terminals on the same hardware module. The digital input common is also not affected by the digital input commons on other hardware modules.

Figure 4.15 Example: Digital input wiring (common = 0 V)

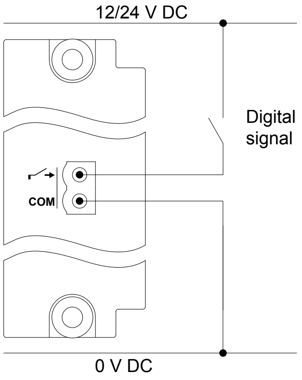
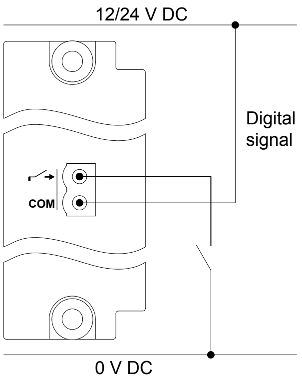


Figure 4.16 Example: Digital input wiring (common = 12 or 24 V)



Safety function wiring

Safety functions, for example, *Emergency stop*, require a normally closed digital signal to be wired to the controller.

Figure 4.17 Example: Digital input wiring for safety functions (common = 0 V)

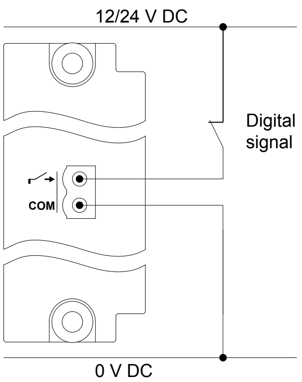
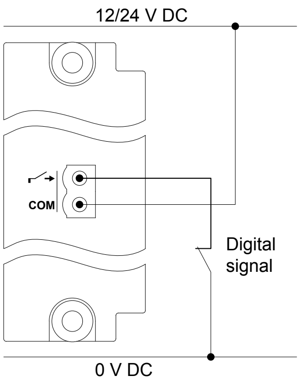


Figure 4.18 Example: Digital input wiring for safety functions (common = 12 or 24 V)



Compliance with EN60255-26

If the wire to an open contact is over 10 m long, then additional measures are required for compliance with EN60255-26. You can use a 1 kΩ resistor to common, or you can use a twisted or shielded wire to the open contact.

Figure 4.19 Example: 1 kΩ resistor to common for compliance with EN60255-26

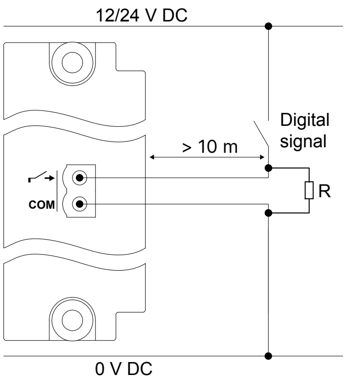


Figure 4.20 Example: Twisted wire for compliance with EN60255-26

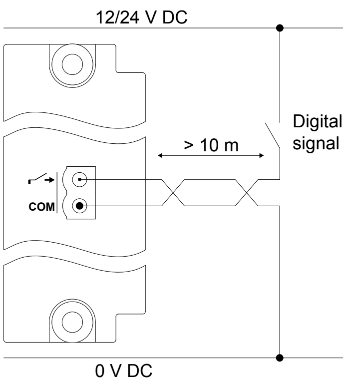


Figure 4.21 Example: Shielded wire for compliance with EN60255-26

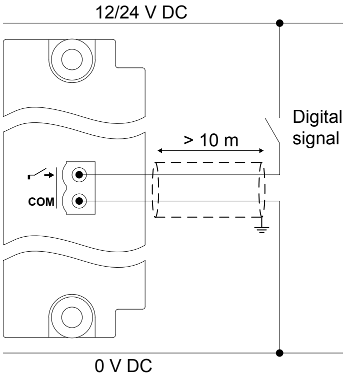
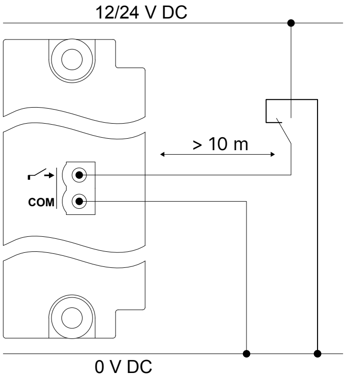


Figure 4.22 Example: Closed contact for compliance with EN60255-26



4.8.6 Analogue multifunctional inputs wiring

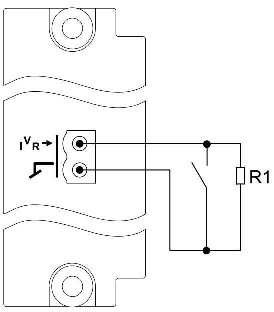
The I/O configuration determines whether the input is current or resistance. For resistance, the I/O configuration also determines the type of resistance input.

NOTICE
Before connecting external transmitter   Configure the terminals correctly (that is, for current or for voltage) before connecting the external transmitter.

Digital inputs with wire break detection

Wire-break detection with maximum resistance for ON detection: 100 Ω to 400 Ω.

Figure 4.23 Connection of a dry contact with cable supervision

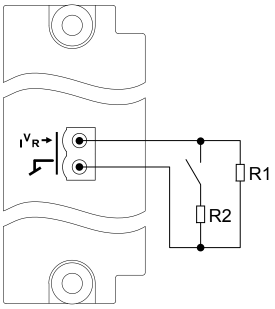


Requirements:

- The maximum resistance for the circuit and resistor (R1) is 330 Ω.

- R1 must be connected to the switch, and not to the controller terminals.

Figure 4.24 Connection of a dry contact with cable supervision, and short circuit detection



Requirements:

- The maximum resistance for the circuit and resistor (R1) is 330 Ω.
- The resistance of R2 must be less than R1.
- R1 must be connected to the switch, and not to the controller terminals.

Current input

The current input may be either active or passive, and a combination of active and passive inputs may be used.

Figure 4.25 Connection of an active transducer

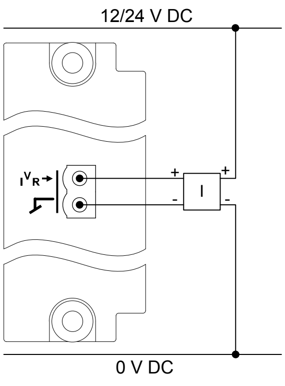
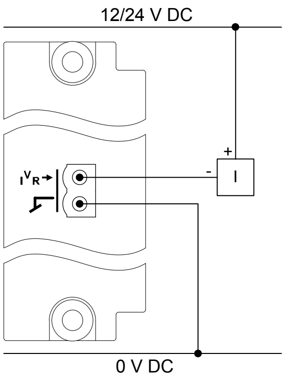
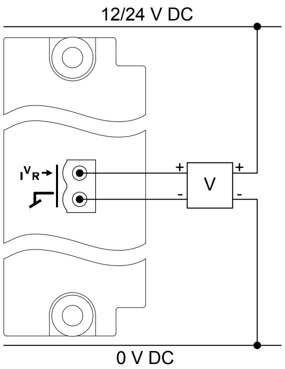


Figure 4.26 Connection of a passive transducer



Voltage input

The following diagram shows the connection for voltage input.



Resistance input

The resistance inputs are always passive inputs. The controller sends a small current through the external equipment and measures the resistance.

NOTE There is no software compensation for the wire length to the resistance input. Errors due to wire length can be adjusted by creating a custom graph for the analogue input in PICUS.

Figure 4.27 Connection of a 2-wire Pt100/1000 sensor

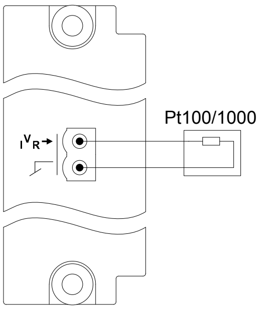
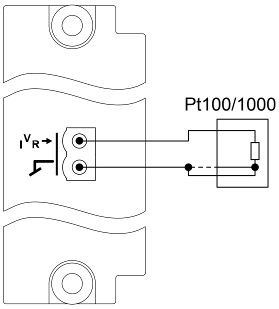
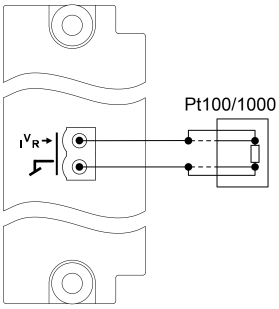


Figure 4.28 Connection of a 3-wire Pt100/1000 sensor



You do not have to connect the third wire (shown by the dashed line). If you want to connect the third wire, connect it to the common, as shown in the diagram.

Figure 4.29 Connection of a 4-wire Pt100/1000 sensor



You do not have to connect the third and fourth wires (shown by the dashed lines). If you want to connect them, connect them as shown in the diagram.

Figure 4.30 Connection of a 1-wire resistance measurement input (RMI)

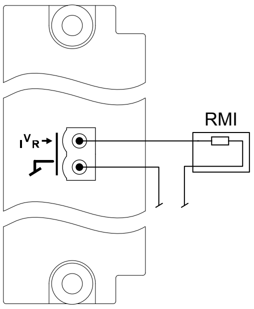
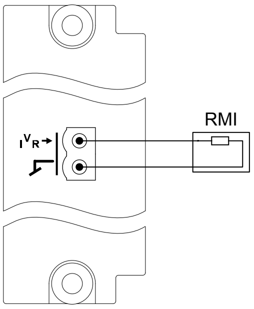


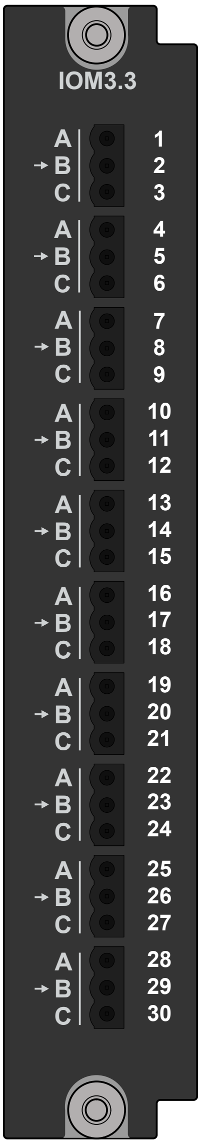
Figure 4.31 Connection of a 2-wire resistance measurement input (RMI)



4.9 Input/output module IOM3.3

4.9.1 IOM3.3 terminal connections

Table 4.6 IOM3.3 Analogue multifunctional inputs



Term.	Symbol	Name	Type	Default
1 2 3	A →B C	Analogue input	Current input 0 to 20 mA or 4 to 20 mA Voltage input -10 to 10 V DC or 0 to 10 V DC RMI 2 or 3 wire 0 to 4.5 kΩ ±1 Ω RMI 1 wire 0 to 4.5 kΩ ±2 Ω Pt100 -200 to 850 °C Pt1000 -200 to 850 °C Thermocouple E: -200 to 1000 °C J: -210 to 1200 °C K: -200 to 1372 °C N: -200 to 1300 °C R: -50 to 1768 °C S: -50 to 1768 °C T: -200 to 400 °C	Configurable
4 5 6	A →B C	Analogue input		Configurable
7 8 9	A →B C	Analogue input		Configurable
10 11 12	A →B C	Analogue input		Configurable
13 14 15	A →B C	Analogue input		Configurable
16 17 18	A →B C	Analogue input		Configurable
19 20 21	A →B C	Analogue input		Configurable
22 23 24	A →B C	Analogue input		Configurable
25 26 27	A →B C	Analogue input		Configurable
28 29 30	A →B C	Analogue input		Configurable

4.9.2 Analogue multifunctional inputs

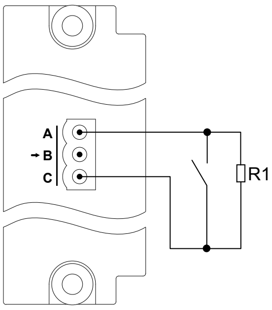
The I/O configuration determines whether the input is current or resistance. For resistance, the I/O configuration also determines the type of resistance input.

NOTICE
Before connecting the external transmitter Configure the terminals correctly (that is, for current or for voltage) before connecting the external transmitter.

4.9.3 Digital inputs wiring with wire break detection

Wire-break detection with maximum resistance for ON detection: 100 Ω to 400 Ω.

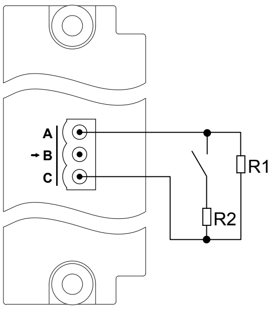
Figure 4.32 Connection of a dry contact with cable supervision



Requirements:

- The maximum resistance for the circuit and resistor (R1) is 330 Ω.
- R1 must be connected to the switch, and not to the controller terminals.

Figure 4.33 Connection of a dry contact with cable supervision, and short circuit detection



Requirements:

- The maximum resistance for the circuit and resistor (R1) is 330 Ω.
- The resistance of R2 must be less than R1.
- R1 must be connected to the switch, and not to the controller terminals.

4.9.4 Analogue current inputs wiring

The current input may be either active or passive, and a combination of active and passive inputs may be used.

Figure 4.34 Connection of an active transducer

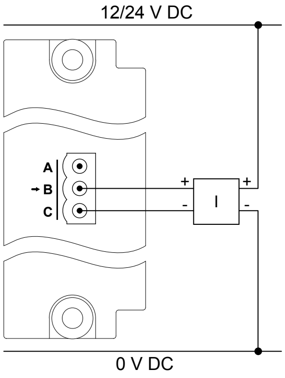
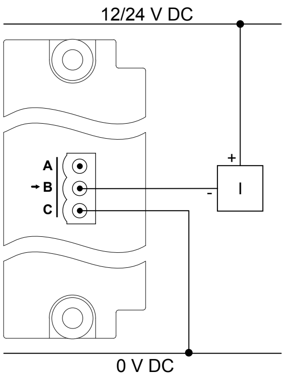
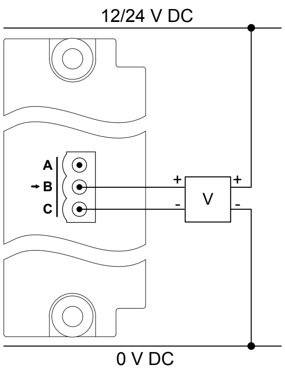


Figure 4.35 Connection of a passive transducer



4.9.5 Analogue voltage inputs wiring

The following diagram shows the connection for voltage input.



4.9.6 Analogue resistance inputs wiring

The resistance inputs are always passive inputs. The controller sends a small current through the external equipment and measures the resistance.

NOTE There is no software compensation for the wire length to the resistance input. Errors due to wire length can be adjusted by creating a custom graph for the analogue input in PICUS.

Figure 4.36 Connection of a 2-wire Pt100/1000 sensor

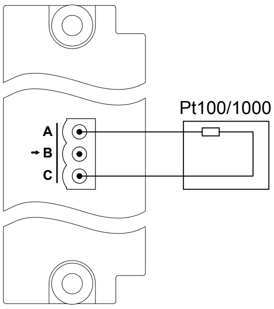


Figure 4.37 Connection of a 3-wire Pt100/1000 sensor

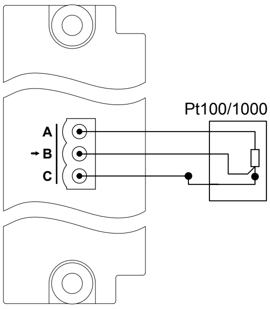
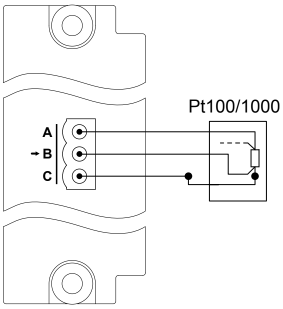


Figure 4.38 Connection of a 4-wire Pt100/1000 sensor



You do not have to connect the fourth wire (shown by the dashed line).

Figure 4.39 Connection of a 1-wire resistance measurement input (RMI)

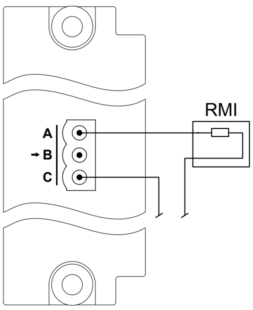


Figure 4.40 Connection of a 2-wire resistance measurement input (RMI)

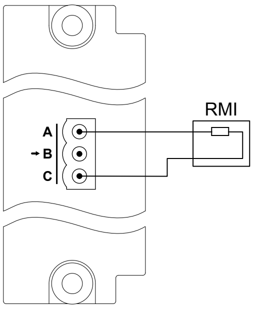
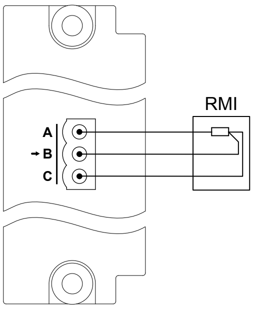
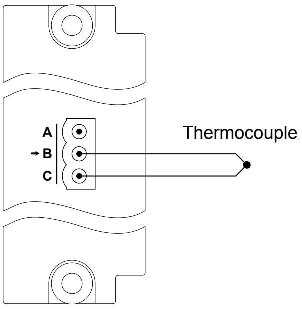


Figure 4.41 Connection of a 3-wire resistance measurement input (RMI)



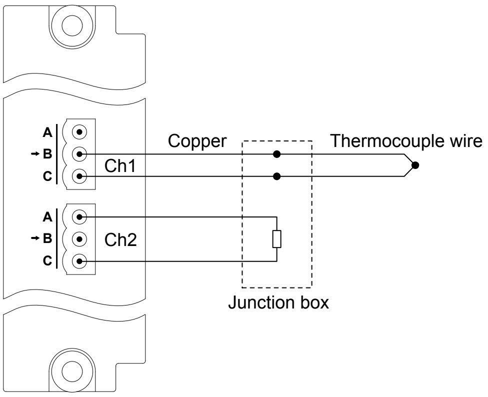
4.9.7 Analogue thermocouple inputs wiring

Figure 4.42 Connection of thermocouple with internal compensation input



Compensation occurs in the IOM3.3 module.

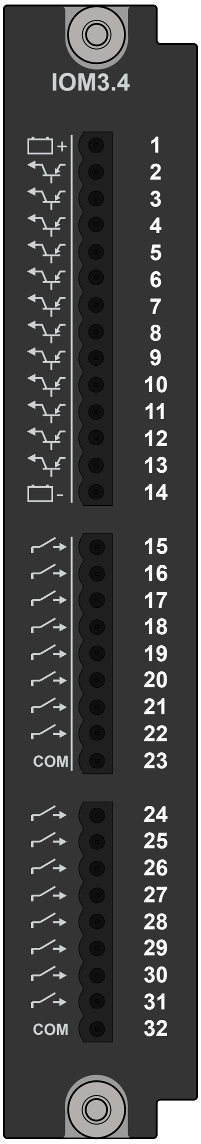
Figure 4.43 Connection of thermocouple with external compensation input



The cold junction compensation can be wired to any input on the controller that can measure a temperature sensor.

4.10 Input/output module IOM3.4

4.10.1 IOM3.4 terminal connections

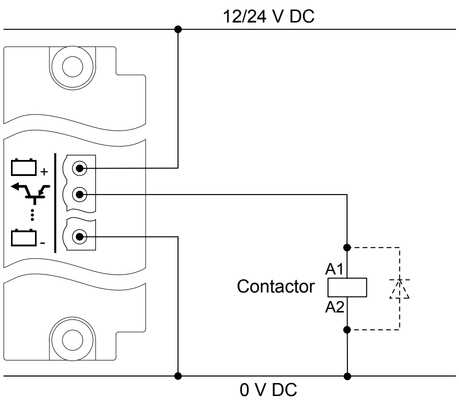


Term.	Symbol	Name	Type	Default
1		Positive supply	Positive supply for digital output terminals 2 to 13 (12 or 24 V DC) (nominal), maximum 36 V DC	Positive supply
2		Digital output	**Digital outputs:** **Maximum current:** < 55 °C: 250 mA (per output) **Leak current:** Typical 1 µA, maximum 100 µA **Saturation voltage:** Maximum 0.5 V **Non-replaceable:** 4 A fuse **Voltage withstand:** ±36 V DC	Configurable
3		Digital output		Configurable
4		Digital output		
5		Digital output		Configurable
6		Digital output		
7		Digital output		Configurable
8		Digital output		
9		Digital output		Configurable
10		Digital output		
11		Digital output		Configurable
12		Digital output		Configurable
13		Digital output		Configurable
14		Common	Common for digital output terminals 2 to 13	Negative supply
15		Bi-directional input	**Digital inputs:** **OFF:** 0 to 2 V DC **ON:** 8 to 36 V DC **Impedance:** 4.7 kΩ	Configurable
16		Bi-directional input		Configurable
17		Bi-directional input		Configurable
18		Bi-directional input		Configurable
19		Bi-directional input		Configurable
20		Bi-directional input		Configurable
21		Bi-directional input		Configurable
22		Bi-directional input		Configurable
23	COM	Common	Common for digital input terminals 15 to 22	

	Term.	Symbol	Name	Type	Default
	24		Bi-directional input	**Digital inputs:** **OFF:** 0 to 2 V DC **ON:** 8 to 36 V DC **Impedance:** 4.7 kΩ	Configurable
	25		Bi-directional input		Configurable
	26		Bi-directional input		Configurable
	27		Bi-directional input		Configurable
	28		Bi-directional input		Configurable
	29		Bi-directional input		Configurable
	30		Bi-directional input		Configurable
	31		Bi-directional input		Configurable
	32	COM	Common	Common for digital input terminals 24 to 31	

4.10.2 Digital output wiring

Each transistor has a normally open terminal ( ). The transistor group has a positive supply terminal (+), and a common (-). The following diagram shows the connection of the transistor output to an external contactor.



NOTE You can install a diode ( ) to reduce electromagnetic interference.

4.10.3 Digital input wiring

The digital inputs are bi-directional, so you can swap the terminal connections around without affecting the performance..

However, all the digital inputs in a group share a common terminal. The digital input common for a module may be either low (connected to 0 V), or high (connected to 12 or 24 V):

- If common is low: All the digital input signals connected to the group must be high (connected to 12 or 24 V).
- If common is high: All the digital input signals connected to the group must be low (connected to 0 V).

The digital input common is not used as the common for any of the other terminals on the same hardware module. The digital input common is also not affected by the digital input commons on other hardware modules.

Figure 4.44 Example: Digital input wiring (common = 0 V)

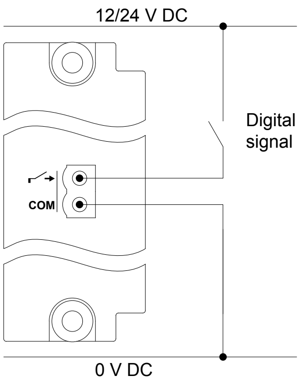
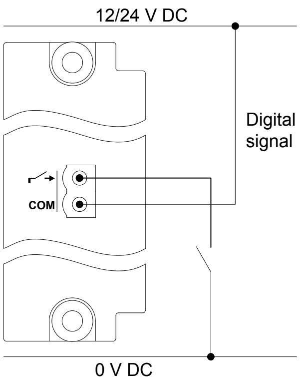


Figure 4.45 Example: Digital input wiring (common = 12 or 24 V)



Safety function wiring

Safety functions, for example, *Emergency stop*, require a normally closed digital signal to be wired to the controller.

Figure 4.46 Example: Digital input wiring for safety functions (common = 0 V)

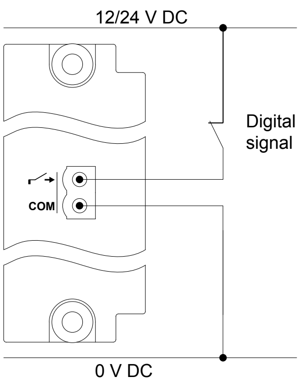
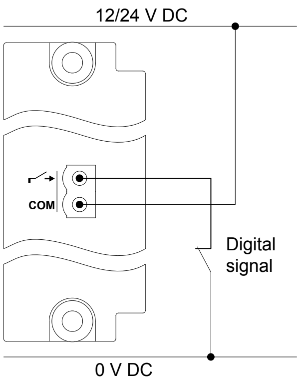


Figure 4.47 Example: Digital input wiring for safety functions (common = 12 or 24 V)



Compliance with EN60255-26

If the wire to an open contact is over 10 m long, then additional measures are required for compliance with EN60255-26. You can use a 1 kΩ resistor to common, or you can use a twisted or shielded wire to the open contact.

Figure 4.48 Example: 1 kΩ resistor to common for compliance with EN60255-26

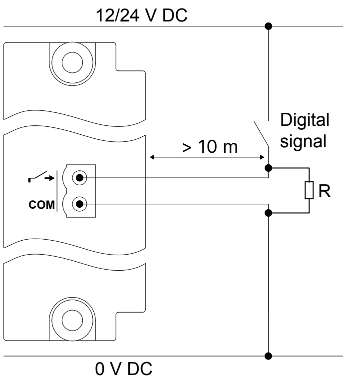


Figure 4.49 Example: Twisted wire for compliance with EN60255-26

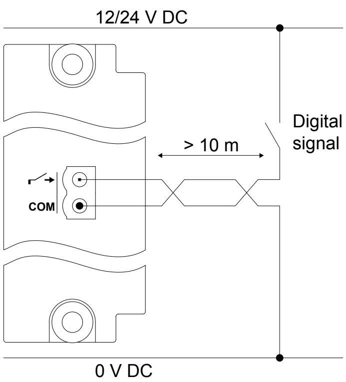


Figure 4.50 Example: Shielded wire for compliance with EN60255-26

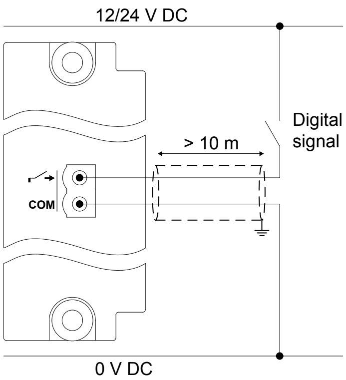
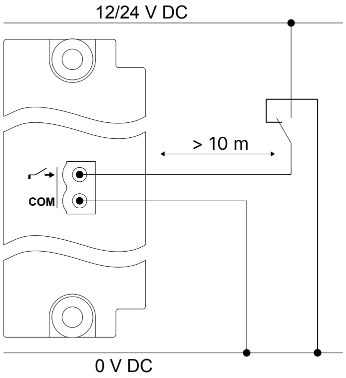
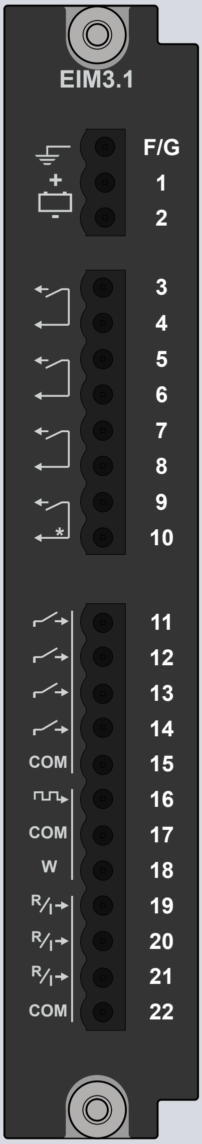


Figure 4.51 Example: Closed contact for compliance with EN60255-26



4.11 Engine interface module EIM3.1

4.11.1 EIM3.1 terminal connections



Term.	Symbol	Name	Type	Default
F/G		F/G	Ground	Frame ground
1		+	12 or 24 V DC (nominal) *	Power supply *
2		-	0 V DC	
3		Normally open	**Relay output:** 30 V DC and 6 A	Configurable
4		Common		
5		Normally open	**Relay output:** 30 V DC and 6 A	Configurable
6		Common		
7		Normally open	**Relay output:** 30 V DC and 6 A	Configurable
8		Common		
9		Normally open	**Relay output with wire break detection:** 30 V DC and 6 A	Configurable
10		Common		
11		Bi-directional input	**Digital inputs:** **OFF:** 0 to 2 V DC **ON:** 8 to 36 V DC **Impedance:** 4.7 kΩ	Configurable
12		Bi-directional input		Configurable
13		Bi-directional input		Configurable
14		Bi-directional input		Configurable
15	COM	Common	Common for digital input terminals 11 to 14	
16		MPU input	MPU input (Voltage: 2 to 70 V AC peak, Frequency: 2 to 20,000 Hz)	Magnetic pickup
17	COM	Common	Common for MPU or W input	
18	W	W input	W input (Voltage: 8 to 36 V AC, Frequency: 2 to 20,000 Hz)	Generator tacho or NPN/PNP sensor
19	R/I	Analogue RMI input	**Analogue current or resistance measurement input (RMI):** **Current input:** 0 to 20 mA, or 4 to 20 mA **Pt100/1000:** -40 to 250 °C **Resistance measurement:** 0 to 2.5 kΩ **Digital input (dry contact with cable supervision):** maximum 330 Ω for ON detection **Minimum current rating for connected relays:** 2.5 mA	Configurable
20	R/I	Analogue RMI input		Configurable
21	R/I	Analogue RMI input		Configurable
22	COM	Common	Analogue input common	

NOTE * If the EIM3.1 is used as independent shutdown unit, maritime classification societies require an independent power supply connected to terminals 1-2. Be aware that not all classification societies accepts EIM3.1 as independent shutdown unit. Please see the type approval certificate from the classification society in question..

4.11.2 Frame ground wiring

Create a protective earth:

1. Connect the frame ground terminal to the protective earth connection.
2. Connect the frame ground terminal to the cabinet.
3. Connect the rack to the cabinet.

The frame ground is connected to the power supply terminals through transient voltage suppression diodes (transorbs). In order to protect the frame ground and power supply, max. 36 V is allowed between the frame ground and the power supply terminals.

4.11.3 Power supply wiring

Connect the power supply (+) to the 12 or 24 V DC power supply, and the power supply (-) to the 0 V DC power supply.

Figure 4.52 Recommended wiring for the power supply

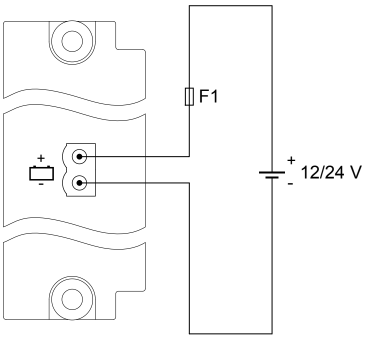
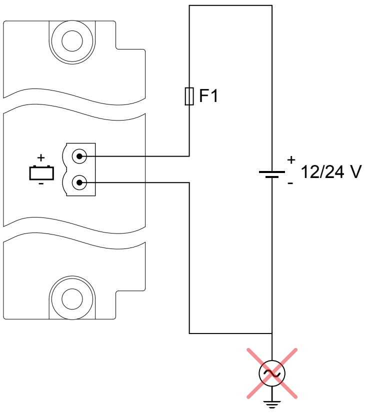


Figure 4.53 Incorrect wiring of the power supply



If the EIM power supply fails or is not connected, the PSM will supply power to the EIM.

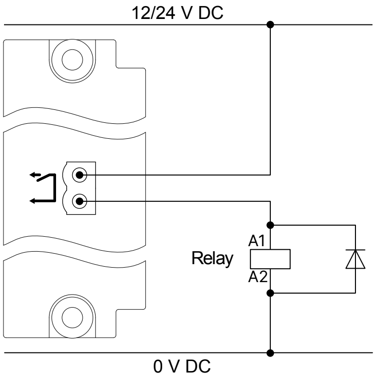
If the PSM power supply fails, the EIM will run on its independent power supply. However, the EIM will not supply power to the PSM.

The equipment does not contain a backup power supply. The power supply source must therefore include the necessary power backup.

Class societies require an independent power supply for the EIM. The EIM must therefore not be connected to the same power supply source as the PSM.

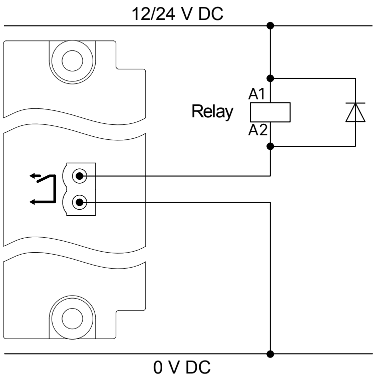
4.11.4 Relay output wiring

The diagram shows the connection of the relay output to an external relay. There is no voltage on the external relay when the controller relay is open.



Use a diode size as recommended by the relay supplier.

You can swap the terminal connections around without affecting the performance.

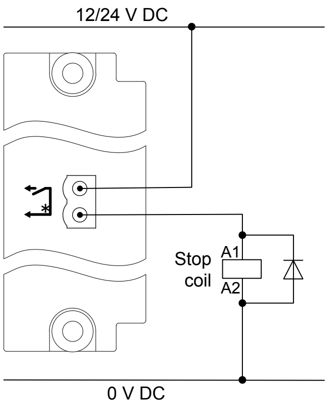


Install a freewheeling diode ( ) to prevent a sudden voltage spike across the inductive load when the voltage source is removed.

4.11.5 Relay output with wire break detection

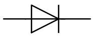
The diagram below shows an example of the wiring for this output.

Figure 4.54 Example: Stop coil relay with wire break detection



Do not connect the terminals to an alternating current supply. Alternating current will destroy the wire break detection.

The relay with wire break detection uses a small, constant current for wire break detection. This current can activate small relays, and cannot be turned off.

Remember to install the freewheeling diode (). This diode prevents a sudden voltage spike across the inductive load when the voltage source is removed.

Checking the relay size

The wire break detection current leak does not activate the relay if this formula is true:

$$V_{release} > (V_{supply} - 4.5\ \mathrm{V}) / (3900\ \Omega + R_{coil}) \times R_{coil}$$

$V_{release}$	The release voltage for the relay (see the relay's data sheet).
V_{supply}	The supply voltage that the relay is connected to (12 or 24 V).
R_{coil}	The relay coil resistance (see the relay's data sheet).

This formula does not include a safety factor.

If the calculation shows that the relay is too small, use a relay with a higher release voltage and/or a smaller coil resistance.

Relay coil resistance calculation example 1

For a 24 V supply, a relay with a 7.5 V release voltage and a 630 Ω coil is proposed.

The right side of the equation is then (24 V - 4.5 V) / (3900 Ω + 630 Ω) × 630 Ω = 2.7 V.

The release voltage (7.5 V) is more than 2.7 V. The wire break detection current leak will not activate this relay.

Relay coil resistance calculation example 2

For a 12 V supply, a relay with a 0.6 V release voltage and an 848 Ω coil is proposed.

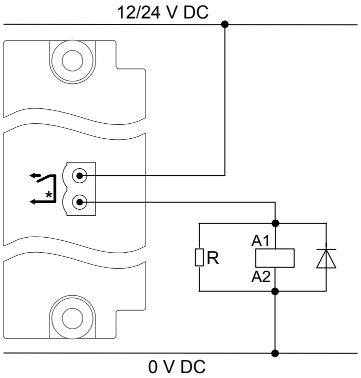
The right side of the equation is then (12 V - 4.5 V) / (3900 Ω + 848 Ω) × 848 Ω = 1.3 V.

The release voltage (0.6 V) is less than 1.3 V. The wire break detection current leak will activate this relay. Use a bigger relay, or use an external resistor to prevent relay activation.

Using an external resistor to prevent relay activation

If you do not need to detect a wire break in the stop coil, you can install an external resistor to stop the wire break detection current leak from activating the relay.

Figure 4.55 Wiring example for external resistor to stop the wire break current leak from activating the relay



Use the following formula to calculate the maximum resistor size (in ohms):

$$R_{resistor} < R_{coil} \times V_{release} \times (2 \times R_{coil} + 7800) / (2 \times R_{coil} \times V_{supply} - 9 \times R_{coil} - 7800 \times V_{release} - 2 \times R_{coil} \times V_{release})$$

This formula does not include a safety factor.

If you get a negative result on the right side, then you do not need a resistor.

External resistor size calculation example

For a 24 V supply, a relay with a 1.2 V release voltage and a 3390 Ω coil is proposed. The wire break detection current will activate this relay, and so an external resistor is required.

The external resistor must have less resistance than:
3390 × 1.2 × (2 × 3390 + 7800) / (2 × 3390 × 24 - 9 × 3390 - 7800 × 1.2 - 2 × 3390 × 1.2) = 517 Ω

Use a 470 Ω resistor to stop the wire break detection current leak from activating this relay.

Use an external resistor to prevent wire break detection in the stop coil.

4.11.6 Digital input wiring

The digital inputs are bi-directional, so you can swap the terminal connections around without affecting the performance..

However, all the digital inputs in a group share a common terminal. The digital input common for a module may be either low (connected to 0 V), or high (connected to 12 or 24 V):

- If common is low: All the digital input signals connected to the group must be high (connected to 12 or 24 V).
- If common is high: All the digital input signals connected to the group must be low (connected to 0 V).

The digital input common is not used as the common for any of the other terminals on the same hardware module. The digital input common is also not affected by the digital input commons on other hardware modules.

Figure 4.56 Example: Digital input wiring (common = 0 V)

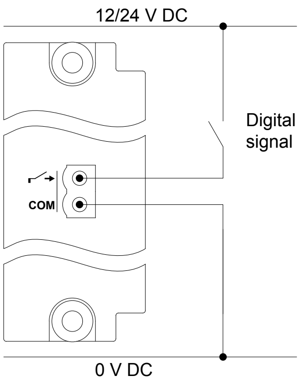
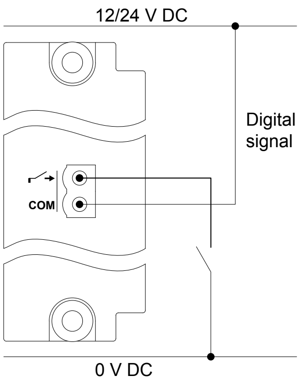


Figure 4.57 Example: Digital input wiring (common = 12 or 24 V)



Safety function wiring

Safety functions, for example, *Emergency stop*, require a normally closed digital signal to be wired to the controller.

Figure 4.58 Example: Digital input wiring for safety functions (common = 0 V)

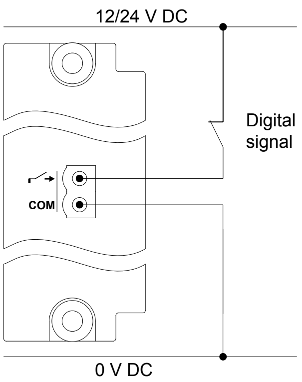
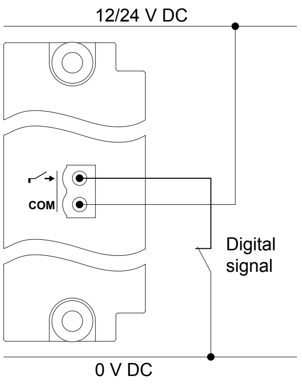


Figure 4.59 Example: Digital input wiring for safety functions (common = 12 or 24 V)



Compliance with EN60255-26

If the wire to an open contact is over 10 m long, then additional measures are required for compliance with EN60255-26. You can use a 1 kΩ resistor to common, or you can use a twisted or shielded wire to the open contact.

Figure 4.60 Example: 1 kΩ resistor to common for compliance with EN60255-26

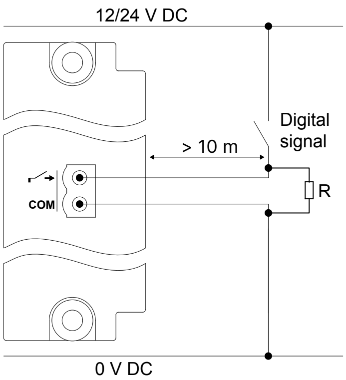


Figure 4.61 Example: Twisted wire for compliance with EN60255-26

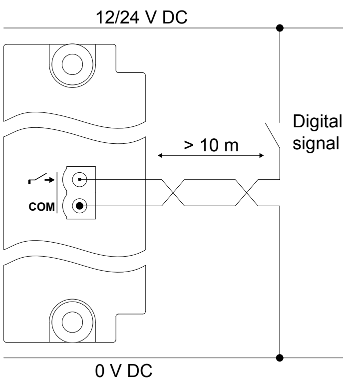


Figure 4.62 Example: Shielded wire for compliance with EN60255-26

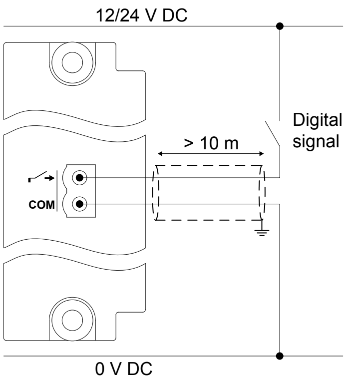
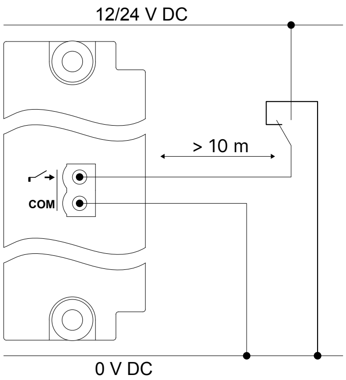


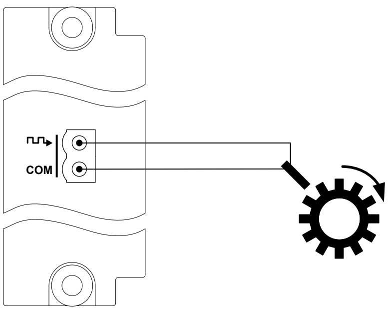
Figure 4.63 Example: Closed contact for compliance with EN60255-26



4.11.7 Magnetic pickup unit (MPU) input wiring

If you use the MPU input, you cannot at the same time use the W input. Connecting both the MPU and W inputs at the same time will lead to incorrect readings.

The MPU input wiring is shown in the following diagram. You can swap the MPU terminal connections around on the equipment without affecting the performance. If an MPU is used, a wire break can be detected.

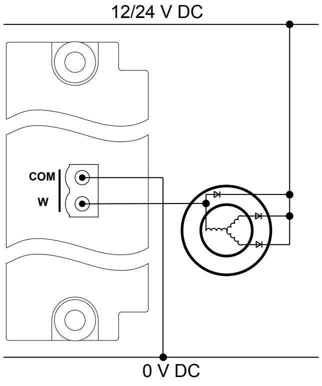


4.11.8 W input wiring

The W input can be used for a signal from one of the phases of the generator, or for an NPN or PNP input.

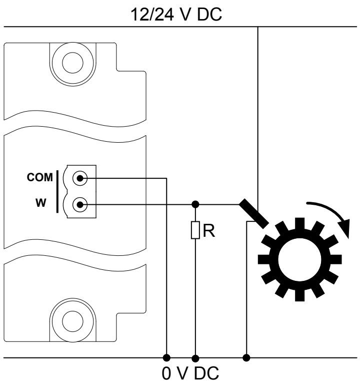
If you use the W input, you cannot at the same time use the MPU input. Connecting both the MPU and W inputs at the same time will lead to incorrect readings.

The connection of the W output from the generator is shown below.



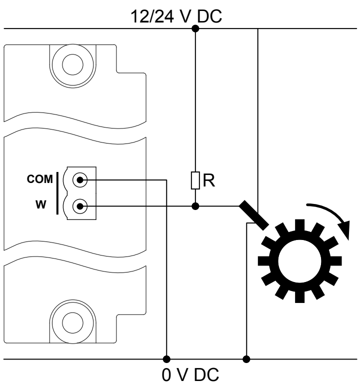
PNP input to W terminal

The connection of a PNP input, with a pull-down resistor, is shown below. The resistor, with resistance as recommended by the PNP supplier, should be placed close to the controller module.



NPN input to W terminal

The connection of an NPN input, with a pull-up resistor, is shown below. The resistor, with resistance as recommended by the NPN supplier, should be placed close to the controller module.



4.11.9 Analogue current or resistance inputs wiring

The I/O configuration determines whether the input is current or resistance. For resistance, the I/O configuration also determines the type of resistance input.

Current input

The current input may be either active or passive, and a combination of active and passive inputs may be used.

Figure 4.64 Connection of an active transducer

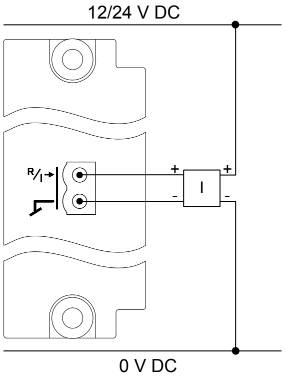
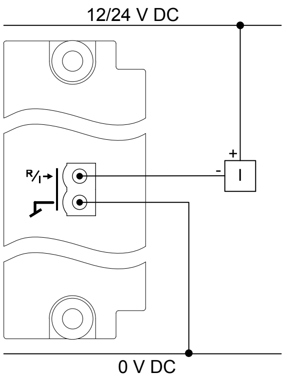


Figure 4.65 Connection of a passive transducer



Resistance input

The resistance inputs are always passive inputs. The controller sends a small current through the external equipment and measures the resistance.

There is no software compensation for the wire length to the resistance input. Errors due to wire length can be adjusted by creating a custom graph for the analogue input in PICUS.

Figure 4.66 Connection of a 2-wire Pt100/1000 sensor

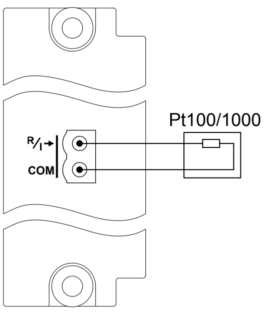
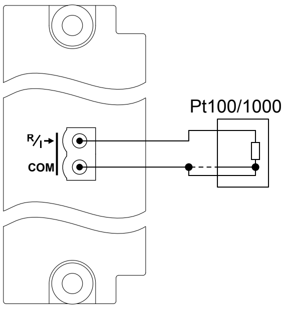
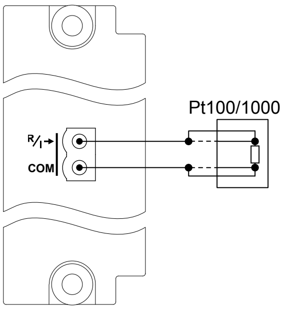


Figure 4.67 Connection of a 3-wire Pt100/1000 sensor



You do not have to connect the third wire (shown by the dashed line). If you want to connect the third wire, connect it to the common, as shown in the diagram.

Figure 4.68 Connection of a 4-wire Pt100/1000 sensor



You do not have to connect the third and fourth wires (shown by the dashed lines). If you want to connect them, connect them as shown in the diagram.

Figure 4.69 Connection of a 1-wire resistance measurement input (RMI)

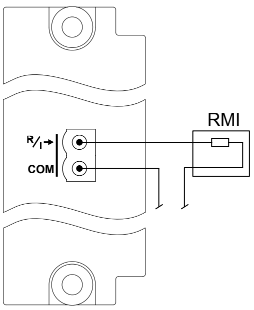


Figure 4.70 Connection of a 2-wire resistance measurement input (RMI)

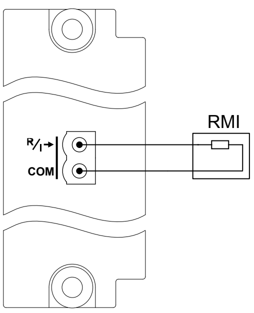
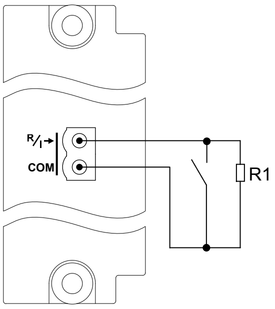


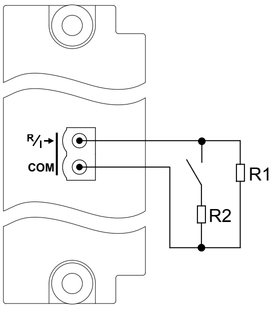
Figure 4.71 Connection of a dry contact with cable supervision



Requirements:

- The maximum resistance for the circuit and resistor (R1) is 330 Ω.
- R1 must be connected to the switch, and not to the controller terminals.

Figure 4.72 Connection of a dry contact with cable supervision, and short circuit detection



Requirements:

- The maximum resistance for the circuit and resistor (R1) is 330 Ω.
- The resistance of R2 must be less than R1.
- R1 must be connected to the switch, and not to the controller terminals.

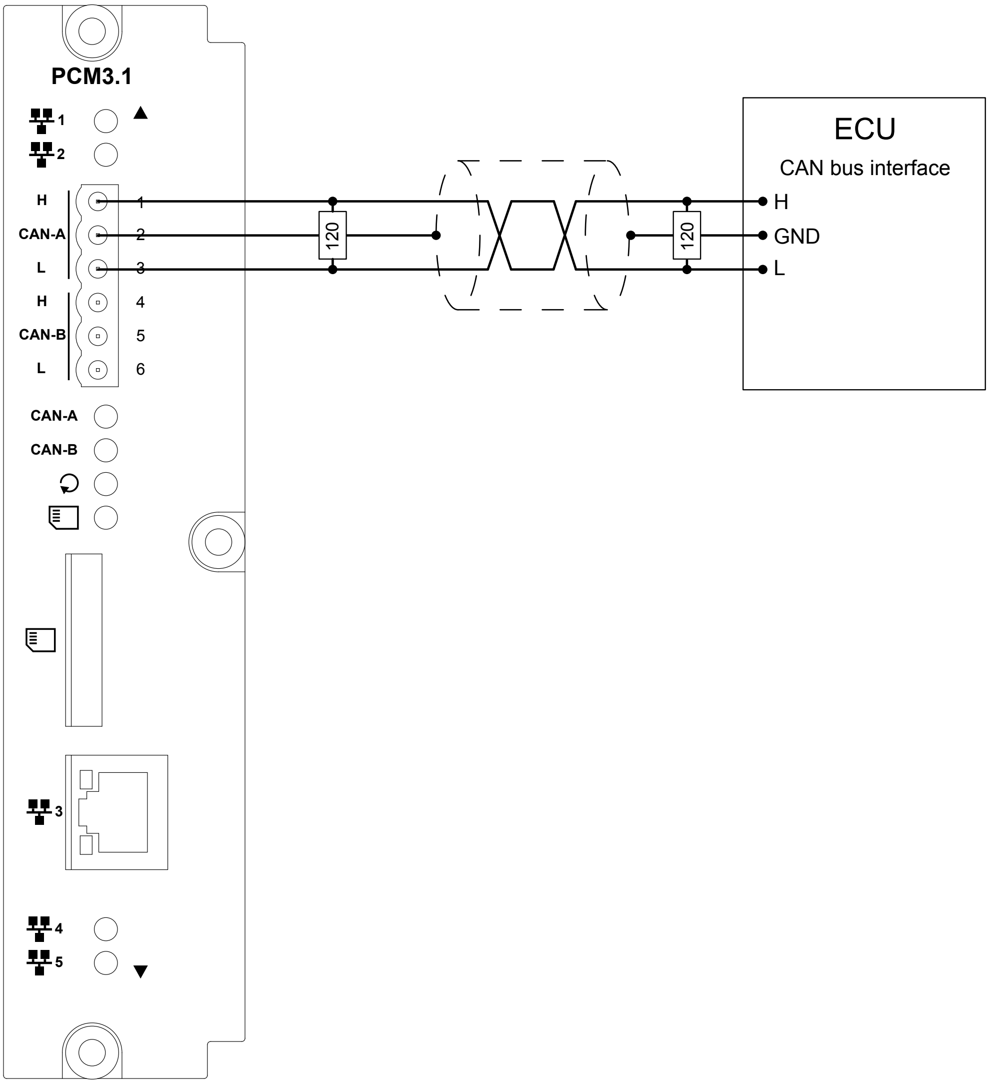
4.12 Processor and communication module PCM3.1

4.12.1 PCM3.1 terminal connections

Term.	Symbol	Name	Type	Default
	1	Port 1	Ethernet network RJ45 (Top of rack, bottom port)	Configurable
	2	Port 2	Ethernet network RJ45 (Top of rack, top port)	Configurable
1	H	CAN high	CAN bus A	
2	CAN-A	CAN signal ground		
3	L	CAN low		
4	H	CAN high	CAN bus B	
5	CAN-B	CAN signal ground		
6	L	CAN low		
		SD card	External memory	
	3	Port 3	Ethernet network RJ45	Configurable
	4	Port 4	Ethernet network RJ45 (Bottom of rack, top port)	Configurable
	5	Port 5	Ethernet network RJ45 (Bottom of rack, bottom port)	Configurable

4.12.2 CAN bus communication wiring

The CAN bus terminals on the PCM3.1 module are used for communication with an ECU.



Use 120 Ω (Ohm) shielded twisted pair cable. Terminating resistors at the ends of the cable must be 120 Ω (Ohm).

The terminating resistor at the engine side might not be needed, see the engine manufacturer's information.

CAN A and CAN B are galvanically separated from the rest of the controller. No ground loops will be formed if the ECU CAN GND is connected to PE.

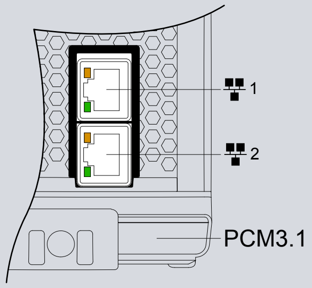
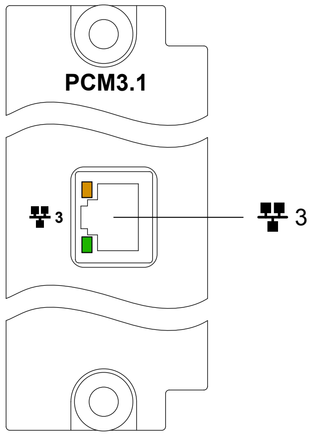
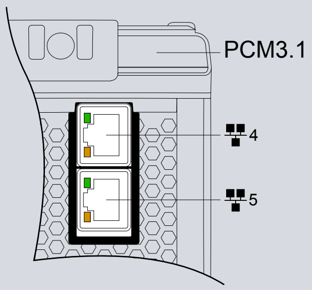
Example cable

Belden 3105A or equivalent, 22 AWG (0.33 mm²) twisted paid, shielded, impedance 120 Ω (Ohm), < 50 mΩ/m, min. 95 % shield coverage.

4.12.3 PCM3.1 Network connections

The Ethernet connections are used for both internal and external communication. Internal communication to other controllers. External communication for SCADA, Modbus TCP, or AMS.

Table 4.7 Location of the network communication ports on PCM3.1

Symbol	Symbol	Port location	Notes
	1	Top of rack, top port	Network communication
	2	Top of rack, bottom port	Network communication
	3	Port on faceplate	Network communication
	4	Bottom of rack, top port	Network communication
	5	Bottom of rack, bottom port	Network communication

Network restrictions

- Controllers must be connected with a **Network chain** configuration.
- The cables must not be longer than 100 metres, point-to-point.
- The cables must meet or exceed the SF/UTP CAT5e specification.
- The network to SCADA, AMS and/or Modbus must be connected to the controllers as branches of the **Network chain**. Do not place these network connections inside the network chain.
- The EtherCAT communication ports on the PSM must not be used for the network communication. They are used to connect controllers to extension racks.

Ethernet port protectors

The controllers have two Ethernet port protectors that cover the Ethernet ports on the top of the controller to protect from dust or other foreign objects during the installation. We recommend that the port protectors remain installed in the ports when these are not in use.

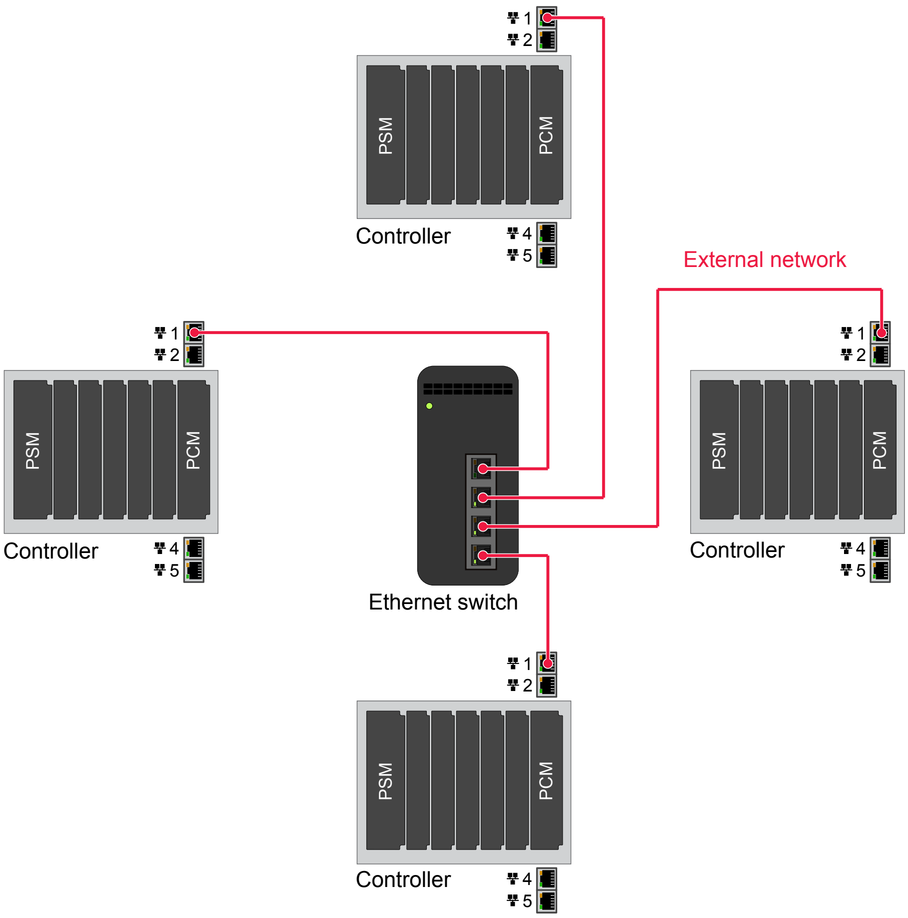
Cable bend radius

Bends in the cables must not be tighter than the minimum bend radius specified by the cable manufacturer. We recommend that you always follow the cable manufacturer's bend radius requirements.

4.12.4 Topology restrictions

Network star

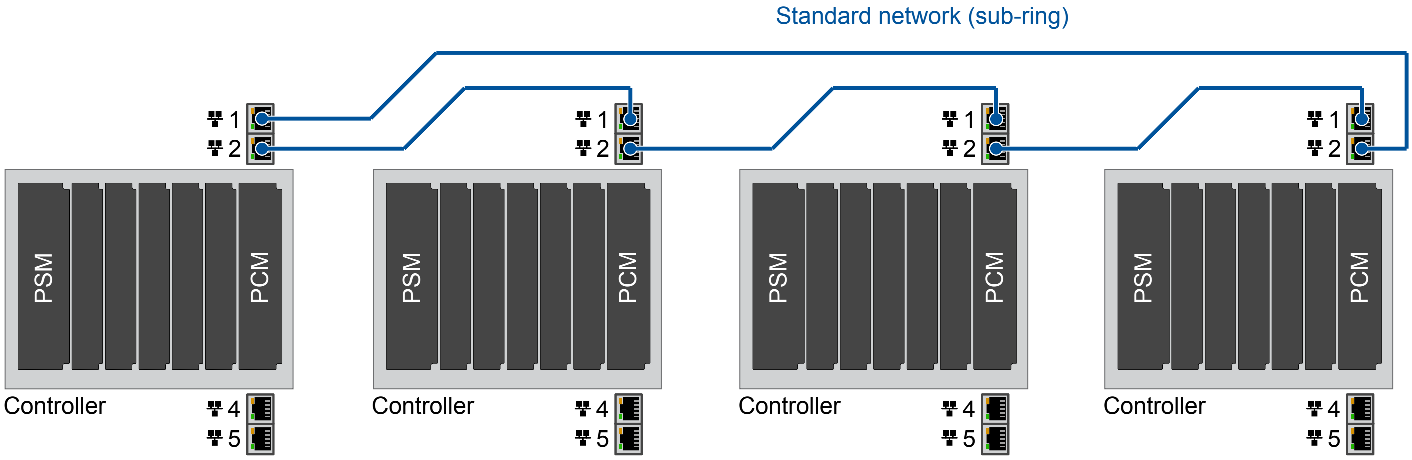
The controllers are connected through a switch.



4.12.5 Topology examples

Controllers must be connected with a **Network chain** configuration.

Network chain



5. Maintenance

5.1 Equipment protection

NOTICE

Warranty

The manufacturer's warranty will not apply if the rack has been opened by unauthorised persons. However, you are allowed to replace the battery on the PCM3.1 module. To retain the warranty, the battery must be replaced by a qualified person, and obey these instructions.

NOTICE

Correct handling of modules

Failure to follow these instructions could lead to damage to the modules.

Read and follow the instructions to avoid damage to the modules.

DANGER!

Hazardous live currents and voltages

Hazardous live currents and voltages may be present in an installed rack. Contact with these could kill you. Only authorised personnel, who understand the precautions needed and the risks involved in working with live electrical equipment, may do this work.

CAUTION

Disrupting control

Working on the rack may disrupt the control of the generator, busbar or connection. Take the necessary precautions.

CAUTION

Protecting equipment: No hot swapping

Disconnect all power supplies before replacing the battery.

NOTICE

Electrostatic discharge

During manufacturing and testing, the products have been kept in static shielding bags, and all personnel handling the products have been protected against static electricity and the subsequent ESD (electrostatic discharge).

Be sure to carry a connection to earth when handling our PCBs.

NOTICE

Torque damage to equipment

Do not use power tools during the installation/replacement. Too much torque damages the equipment.

Follow the instructions for the correct amount of torque to apply.

5.2 Mount or replace hardware modules

The controller is normally supplied with the hardware modules mounted. However, it is possible for you to add or replace a hardware module. If you need to add a hardware module, use the first empty slot from the left of the rack.

Each module is fastened to the rack with TX20 screws. These should be loosened before the extraction handles are used to lift the module free of the rack. They do not remove completely from the hardware module.

When mounting the modules the TX20 screws must be tightened with 0.5 N·m (4.4 lb-in).

Remove a hardware module

1. Protect the hardware modules against static discharge.
   - It is recommended to use a wrist strap connection to protect against Electrostatic discharge (ESD).
   - Test the resistance of the wrist strap and the wrist strap connection. Do not continue if the wrist strap connection is faulty. Use the wrist strap at all times while installing or uninstalling the modules.
2. Disconnect all power supplies to protect the hardware modules and personnel.
3. Remove the terminal blocks, and make sure that there are no wires in the way of removing the hardware module.
4. Disconnect any Ethernet cables from the top and bottom of the module and the plastic shielding at the ports.
5. Loosen the module faceplate screws with a TX20 screwdriver.
   - Do not force the screws to unscrew completely.
   - The screws are built-in and should remain attached to the faceplate.
6. Use pliers or your fingers to pull the faceplate screws, and carefully slide the hardware module out of the rack.
7. Hold the module by the faceplate. Do **not** touch the PCB.
8. If you want to re-use the hardware module, or send it in for testing, be careful to only handle it by its faceplate. Put the hardware module in an ESD protective package after removing it.

Mount or replace a hardware module

1. Protect the hardware modules against static discharge.
   - It is recommended to use a wrist strap connection to protect against Electrostatic discharge (ESD).
   - Test the resistance of the wrist strap and the wrist strap connection. Do not continue if the wrist strap connection is faulty. Use the wrist strap at all times while installing or uninstalling the modules.
2. Disconnect all power supplies to protect the hardware modules and personnel.
3. Open the ESD protective package, and remove the new module, holding it only by the faceplate.
4. Slide the module into the correct slot (it should slide in easily).
5. Tighten the screws on the module faceplate with a TX20 screwdriver, and 0.5 N·m (4.4 lb-in) of torque.
6. Replace all the terminal blocks, including any Ethernet cables to the module.
7. If the rack is not mounted, return the rack to its protective packaging.

5.3 Replace RTC battery on PCM3.1 module

The PCM3.1 has a lithium battery for maintaining the real-time clock, when no power is applied. A battery failure alarm is activated, when the battery power is low. It is recommended to replace the battery every 5th year on a scheduled basis. To replace the battery, you need to remove the PCM module.

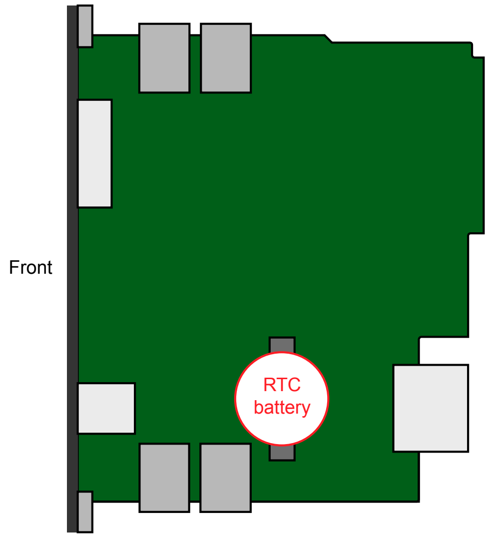
The battery is a CR2430 3V battery, rated for operation at -40 to 85 °C (-40 to 185 °F). This is **not** a standard CR2430 battery.

The CR2430 battery is an available accessory. Contact DEIF for ordering.

Each module is fastened to the rack with TX20 screws. These should be loosened before the extraction handles are used to lift the module free of the rack. They do not remove completely from the hardware module.

When remounting the module the TX20 screws must be tightened with 0.5 N·m (4.4 lb-in).

Location of the battery on module:



How to replace the PCM3.1 battery

1. Protect the hardware modules against static discharge.
   - It is recommended to use a wrist strap connection to protect against Electrostatic discharge (ESD).
   - Test the resistance of the wrist strap and the wrist strap connection. Do not continue if the wrist strap connection is faulty. Use the wrist strap at all times while installing or uninstalling the modules.
2. Disconnect all power supplies to protect the hardware modules and personnel.
3. Locate the PCM3.1 hardware module in the rack.
4. Remove the terminal blocks, and make sure that there are no wires in the way of removing the hardware module.
5. Disconnect any Ethernet cables from the top and bottom of the module and the plastic shielding at the ports.
6. Loosen the module faceplate screws with a TX20 screwdriver.
   - Do not force the screws to unscrew completely.
   - The screws are built-in and should remain attached to the faceplate.
7. Use pliers or your fingers to pull the faceplate screws, and carefully slide the hardware module out of the rack.
8. Hold the module by the faceplate. Do **not** touch the PCB.
9. Locate the battery on the PCB. See above.
10. Carefully remove the old battery from the holder.
11. Insert the new battery in the holder (make sure the polarity is correct).
12. Make sure that the hardware module is the right way up, and slide it back into slot 7 (it should slide in easily).
13. Tighten the screws on the module faceplate with a TX20 screwdriver, and 0.5 N·m (4.4 lb-in) of torque.
14. Replace all the terminal blocks, including any Ethernet cables to the module.

NOTICE

Date and time settings

After the battery is replaced, check that the date and time settings are correct. If the controller was already part of an existing system, then it will automatically adjust the date and time settings to the NTP/clock master. If the controller is not part of a system or is a stand-alone controller you must set the date and time settings.

You can use PICUS or the display to enter the correct date and time settings.